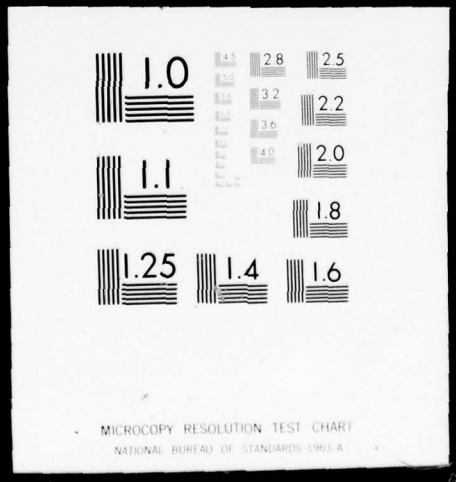
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DELAWARE RIVER BASIN REPORT

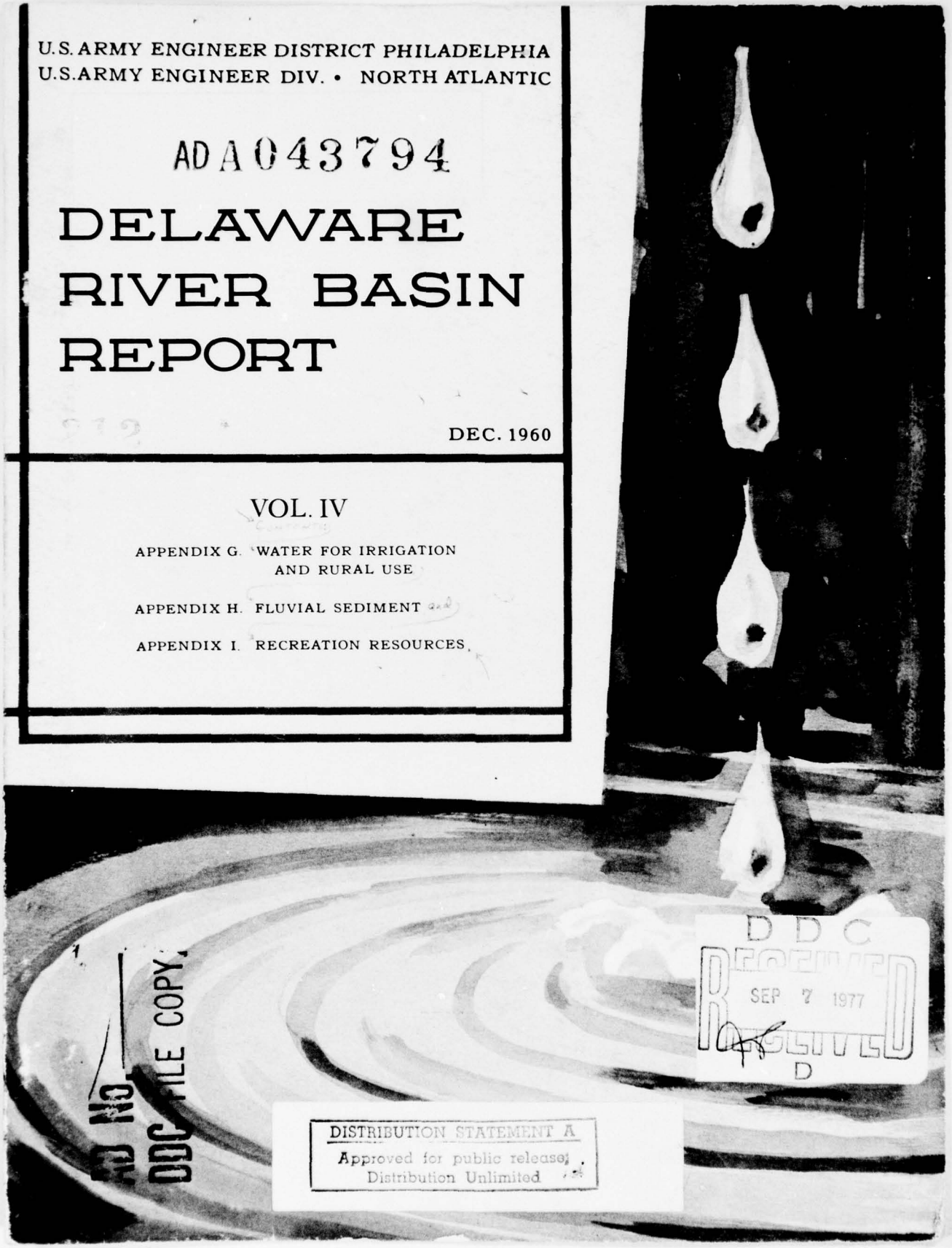
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VOL. IV

APPENDIX G. WATER FOR IRRIGATION AND RURAL USE

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REPORT ON THE COMPREHENSIVE SURVEY OF THE WATER RESOURCES OF THE DELAWARE RIVER BASIN

Volume IV.

APPENDIX G thru I.

WATER FOR IRRIGATION AND RURAL USE

(11) Dec 64 (12) 192 p.

PREPARED BY

UNITED STATES DEPARTMENT OF AGRICULTURE

FOR

U. S. ARMY ENGINEER DISTRICT, PHILADELPHIA
CORPS OF ENGINEERS
PHILADELPHIA, PA.

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APPENDIX G - WATER FOR IRRIGATION AND RURAL USE

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WATER FOR IRRIGATION AND RURAL USE

PART I - INTRODUCTION

1-01. SCOPE OF STUDY AND AREA INVOLVED

This appendix presents an analysis of the potential water demands for rural use in the Delaware River Basin and adjacent areas outside the Basin. It includes irrigation of crops and pasture, rural domestic water supplies, agricultural processing, spraying, milk cooling, washing dairy equipment, cleaning of vegetables for market, and water for livestock.

The report gives a projected average dollar value of water for irrigation purposes. No attempt was made to estimate a dollar value for water for rural domestic uses. It is assumed that domestic rural uses would always have a high priority and that sufficient supplies can be ained with relative ease.

The nature of water as a source has necessitated study by regional eas. A field study of irrigation and rural water uses was made in the Basin and adjacent areas. It included the entire States of New Jersey and Delaware. In New York and Pennsylvania, the study was confined to the Delaware River Watershed. No study was made in Maryland.

For the purpose of this report, the Basin has been divided into 10 sub-basins with the adjacent areas bordering the Basin shown by counties (Fig. 1). All figures are placed at the end of this report. Data from 11 climatological stations shown in Figure 1 were selected for analysis. These data give a cross section of rainfall in the Basin. The stations used were representative of the areas where the highest potential for irrigation is most likely to occur.

This report considers only availability and potential storage of fresh water.

Total area in the Delaware River Basin is 8,169,600 acres. This includes forest land, water areas, and open urban and industrial land. Of the total area, 2,470,119 acres are classified as cropland and 447,623 acres are classified as pasture land. (For detailed description of the area within the Basin, see the appendix entitled "Use and Management of Land and Cover Resources.")

The adjacent areas bordering the Basin considered in this report are the counties to the east of the Basin, including Long Island and parts of counties in Delaware, west and south of the Basin. Nineteen counties in New Jersey, 5 counties in New York, and 1 county in Connecticut are included. (See Part III - Summary)

The east boundary of the Basin splits several of the 19 counties in New Jersey. The 3 counties in Delaware, adjacent to the west and south boundaries, are also divided by the watershed boundaries.

In order to provide adequate data on amounts of water used, number of applications, representative crops being irrigated, and the kind of soils on which irrigation was applied, a detailed study was made in Delaware, in 11 counties in New Jersey, and in the area within the Basin in Pennsylvania, with most of the data from Pennsylvania coming from Bucks, Berks, Chester, and Lehigh Counties.

1-02. ORGANIZATION

This report is organized in three parts. Part I covers the scope of the study and areas involved. Part II relates to irrigation in the Basin for 1954-1956 and 1955-2060. It includes the methods and procedures used to develop the irrigation water requirements within the Basin. Rural residential and agricultural use of water other than irrigation are also discussed in this section. Part III summarizes the report.

PART II - DELAWARE RIVER BASIN

2-01. IRRIGATION -- 1954-1956

The widespread use of water for irrigation by farmers in the Delaware Basin has occurred since 1950, and principally since 1953. Technological improvements, such as lightweight pipe, better spray nozzles, more efficient pumps, availability of technical aid, together with relatively high farm incomes and the impact of two dry seasons close together encouraged commercial farmers to invest in irrigation equipment. Because irrigation is relatively new in the Basin, information indicative of the results that can be expected over a long run period must be developed from limited local experience, deduced from research and experience in other areas that are only roughly comparable to the Delaware Basin situation. This must be combined with the knowledge of technicians involved in the over-all analysis. The long-term projections of irrigation, as presented in this report, must be appraised in light of these major limitations in the data.

Thus, while it is commonly recognized that individual crops respond differently to specific applications of water, the available enterprise data are statistically inadequate as to acreage treated, types of soils,

or years of results from irrigation. The available data for each enterprise was studied and variations were noted, but only general central or modal tendencies could be recognized and, therefore, ranges in costs and returns could not be fully analyzed.

Refinement of results can be made in subsequent years as local experience under irrigation is developed. Detailed enterprise analyses were not possible nor practical under the conditions of available information and limitations of time for this survey. The data that follow represent the best estimates that can be made at this time. They should be supplemented and refined in the future as more information becomes available.

The total area irrigated in 1955 in the Delaware River Basin was about 43,000 acres. Of this amount, 75 percent is located in Sub-basins 7 and 10. Irrigation is concentrated in these two areas because the soils are suitable to production of high value truck crops and ground water supply is readily available at shallow depths. The streams in the northern half of the Basin are very erratic with a wide fluctuation in flow between wet and dry seasons. Figure 2 shows the trend in irrigation in the Delaware Basin for the period 1944 to 1955.

The total irrigated acreage outside the Basin in 1955 was 32,353 acres. About 63 percent of the total irrigation in the water-dependent counties is in Middlesex, Monmouth, Burlington, and Atlantic Counties.

a. Rainfall. The average annual precipitation is fairly uniform for the Basin. For the stations considered, the lowest recorded average annual precipitation in the Basin is 40.25 inches at Reading, Pennsylvania, and the highest recorded is 48.05 inches at Freehold, New Jersey (Table 1).

Rainfall is generally sufficient to fill the crop root zones to capacity during the fall and early spring. About 50 percent of the total rainfall occurs during the growing season of April through September. The need for irrigation arises from the uneven distribution of the precipitation through the crop season.

TABLE 1. AVERAGE ANNUAL RAINFALL AT SELECTED STATIONS

Location	Inches	Location	Inches	Location	Inches
1. Delhi,N.Y.	41.89	4. Reading,Pa.	40.25	8. Newark,Del.	43.70
2. Belvidere,N.J.	46.76	5. Trenton,N.J.	42.50	9. BridgetonNJ	43.38
3. Allentown,Pa.	43.18	6. Freehold,NJ	48.05	10. Dover, Del.	44.70
		7. MoorestownNJ	45.08	11. Milford,Del.	46.20

b. Crops Irrigated. In the area concerned in this study, the great bulk of crops irrigated are vegetables, including sweet corn, potatoes, and tomatoes. Many acres of nursery stock, small fruits, apples, and peaches are irrigated as well as significant acreages of hay and pasture. Sprinkler irrigation for frost protection is often applied to strawberries, cranberries, and blueberries.

c. Soil Factors. The soils in the Delaware Basin vary from coarse sands to clays. For the purpose of this report, the soils were grouped into three textural classes designated by coarse, medium, and fine textured soils. This classification reflects the difference in available water-holding capacities. The sands and loamy sands are representative of the coarse soils, the sandy loams and loams of the medium textured soils, and the silt and clay loams of the fine soils. Coarse soils are able to hold but little water in available form. Medium and fine soils have greater water-holding capacity because of their finer texture. Crops were divided into four groups on the basis of depth of root systems. Thus, Crop Group I develops roots to about 12 inches deep; Group II, from 12 to 18 inches deep; Group III, from 18 to 24 inches deep; and Group IV, 24 inches and deeper. Generally, the deeper the rooting system, the less frequent the need for irrigation under normal conditions. For a given root zone depth, a low moisture-holding capacity soil will require more frequent irrigation than a soil of greater moisture-holding capacity. The more important features of this classification are shown in Table 2.

TABLE 2. TEXTURAL GROUPINGS OF SOILS

Group Designation	Representative Textures Within Group	Available Water-Holding Capacity--Surface Inches Per Foot of Soil Depth
Coarse	Coarse Sands Sands Loamy Sands	.50 - .75
Medium	Sandy Loams Fine Sandy Loams Loams Gravelly Loams	1.00 - 1.50
Fine	Silt Loams Clay Loams Shaly Loams Clays	1.75 - 2.25

(See appendix entitled "Use and Management of Land and Cover Resources" for detailed description of textural groupings of soils listed in Table 2 on previous page.)

d. Field Study. A field study was made in Delaware, New Jersey, and Pennsylvania, to determine present irrigation practices in the Delaware River Basin. In collecting and analyzing field information, crops were divided into four groups on the basis of average depths of rooting systems. This grouping is the same as set up in the Irrigation Guides used by the Soil Conservation Service and developed jointly with the Extension Service and college specialists. Table 3 illustrates the manner of grouping of crops.

TABLE 3. CROP GROUPS ACCORDING TO ROOT DEPTH

Crop Group	Depth of Rooting System	Representative Crops in Each Group
I	6-12"	Lettuce, Onions, Spinach, Strawberries, Beets, Carrots, Peas
II	12-18"	Beans, Cabbage, Broccoli, Potatoes, Grasses
III	18-24"	Tomatoes, Corn, Melons, Pumpkins, Squash, Peppers
IV	24" and deeper	Alfalfa, Asparagus, Apples, Peaches, Fruits, Nursery Stock

(1) New Jersey. Many existing records, dealing with irrigation, list only the acreages of crops grown, with no indication of how much water was used or how many times each year irrigation was necessary. In an attempt to provide adequate data on amounts of water used, a field study was made in 11 counties which in 1955 had reported significant acreages of crops grown under irrigation. Ten of these counties are in the Coastal Plain area.

Primary purposes of the field study were the determination of the number of times irrigation water was applied and the total water applied, expressed as surface inches, for representative crops and representative soils. Figures were developed for 3 soil textural groups (coarse, medium, and fine textured soils). On the basis of water-holding capacity and earlier depletion of the available moisture, the coarse textured soils would be expected to require more water resulting from

more applications during a season of high demand than would finer textured soils with greater available water-holding capacity. Data were secured for different crops representative of the range in rooting depth. This same procedure was used in developing the irrigation data for Pennsylvania and New Jersey.

Records were secured on 5,740 acres of irrigated crops over the cropping seasons of 1954, 1955 and 1956. Emphasis was given to the 1956 season results, since these were the most recent and most easily remembered by the farm operators. Information for the 1955 cropping season was also readily available from most operators, while only a few records for the 1954 season were obtainable.

The data secured from field surveys were summarized according to soil textures and crop groups for each of the three growing seasons.

(2) Pennsylvania. As reported by the U. S. Census, the acreage of irrigated crops in the Delaware River Watershed in Pennsylvania in 1954 is calculated to be 6,000 acres. A fourth of this acreage is in Bucks County, and half of it is in the 3 counties of Berks, Chester and Lehigh. The remainder is scattered over the other Pennsylvania counties within the Basin.

Field studies were made in 6 counties to ascertain frequency of irrigation and amounts of water applied as the basis for calculating total water used. Data were collected for different crop groups (I to IV, based on average depth of rooting systems) and for 2 soil groups, the medium and fine textured soils. No coarse textured soils appear to be devoted to production of irrigated crops in this portion of Pennsylvania. The information collected supplemented and extended data supplied by similar field studies in Delaware and New Jersey, by providing numerous records on irrigation of hay and pasture.

Records were secured on 2,012 acres of irrigated crops over the cropping seasons of 1954, 1955 and 1956. Many good records were available for the 1955 season, a dry year. By contrast, the 1956 season was nearly normal for precipitation and very little irrigation was necessary. Very few records for the 1954 season were indicated by the field study.

(3) Delaware. From a study made under the direction of the University of Delaware, 16,742 acres of crops receiving irrigation in the State of Delaware were reported for the 1954, 1955 and 1956 growing seasons. Information provided by that study included the acreage of specific crops and the number of irrigations applied each season.

Since the study did not report the quantity of irrigation water applied at each irrigation or the amount used per acre for

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the season, supplemental data on these items had to be developed. Firsthand knowledge was obtained by personally contacting the farm owners or operators. They were able to indicate the kinds of soil (primarily textural classes) growing the different crops, by fields, and to relate the amounts of water used per application and for the season for crops on the representative soils.

e. Summary of Field Studies. A study of the field survey data indicated that the seasonal amount of water applied on individual farms for the years 1954, 1955 and 1956 varied widely within counties. This variance in water used is attributable to local climatic conditions. According to rainfall records, one area would experience a significant rainfall while in the adjoining county only a trace would be recorded.

After analyzing the field information and other records on irrigation water use in the Basin, a judgment factor was applied to these data. A weighted seasonal average of 4.1 inches was believed to be representative, and this figure was used in compiling the water used for irrigation in 1955.

f. Sources of Water. In most of the Coastal Plain area, ground water supplies are adequate for irrigation purposes. Direct pumping from wells is the common practice. However, many operators depend on storage ponds which are filled naturally by seepage, or artificially from wells, to assure themselves of supplies to operate their irrigation systems at optimum capacity. A few local areas in the Coastal Plain are known to produce an inadequate supply of ground water for irrigation.

In the Piedmont and Upland areas, water for irrigation comes mostly from surface streams, storages, or municipal supplies since the yields of wells are not enough to supply direct irrigation.

g. Rates and Amounts of Application. Rate of application of irrigation water depends on several factors, the more important of which are the pump or irrigation system capacity; rate of water intake by soil; adequacy of water supplies; the operational pattern of the individual farm, i.e., hours per day a system is operated; and total acreage to be covered. Rate of application per hour is, of course, largely controlled by capacity of the soil to absorb water. The range of rates of application vary from .3 to 1 inch per hour. The field study indicates that many growers apply an inch of water in 3 hours. Individual applications varied from 3/4 inch to 3 inches. The majority of growers apply from 1 to 3 inches of water per irrigation.

h. Frequency of Irrigation. In the field study of water used for irrigation, the frequency of irrigation and the number of

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irrigations per season were determined along with other information. The number of irrigations per season is closely related to several factors, chief of which are the amount and distribution of natural rainfall, length of season of active crop demand, soil texture, depth of crop rooting, and adequacy of water supplies. The present irrigation frequency is at intervals of 7 to 10 days for most crops and soils. On the coarse soils, the interval is generally reduced to 4 to 5 days.

i. Effect of Weather Conditions. Weather conditions during the growing season largely determine the frequency of need for irrigation. Supplies of available water are sometimes inadequate in extremely dry seasons. For this reason, the amount and frequency of water application in such seasons may be less than the rainfall deficiency would suggest. The average monthly precipitation during the growing season of 3 to 4 inches does not reflect a need for irrigation. Climatological records indicate that the total monthly rainfall may come in one or two storms. With rains of this intensity, much of the water is lost in surface runoff and deep percolations below the root zone of plants. As an example of the seriousness of weather conditions, Table 4 was computed for Moorestown, New Jersey, for 1956. The total drought days are less for the 1956 season than for the 20-year average for this location. A drought day is defined as being one in which the supply of available soil moisture within the root zone is exhausted. Table 5 shows events of these drought periods during the crop season.

j. Acres Irrigated. Tables 6 through 11 in this report constitute the essential steps involved in estimating the present irrigation water use in the Delaware Basin. The methods used for preparing data for each table follow:

(1) Table 6. Distribution of Irrigated Crops. The total irrigated crops were obtained from the 1954 Census and Soil Conservation Service field study and were adjusted to sub-basin figures.

(2) Table 7. Distribution of Irrigated Acreages by Root Zone Depths. The total irrigated crop acreage by sub-basins from Table 6 was grouped according to root zone depths as specified in the New Jersey Irrigation Guide for Farm Planners.

(3) Table 8. Distribution of Crop and Pasture Acreage by Available Water-Holding Capacity of Root Zone Depths. This table was prepared by distributing the irrigated acreage according to water-holding capacities of the root zone depths in Table 7.

(4) Table 9. Amount of Water Used for Irrigation. The data for this table were calculated from information obtained from the field study of present irrigation practices in 3 states. The average season (April through September) application is 4.1 inches. Irrigators generally used a rule of thumb of applying 1 inch of water per week when there

is no rainfall. The field survey did not indicate a significant difference in the amount of water applied on the various soil textures.

(5) Table 10. Sources of Water for Irrigated Acreage. The source of water supplied for 1955 was obtained from the field study made in three states on a county basis.

(6) Table 11. Estimate of Water Needed for the 1955 Irrigation Season Based on Climatological Data. The data for this table were taken from Table 8, which gives the distribution of irrigated acreages by water-holding capacities of root zone depths. From the climatological records for 1955 and the computed consumptive use values, the number of drought days for each of the root zones were determined. The inches of water needed were obtained by multiplying the drought days in each group by the average seasonal consumptive use.

(7) Figure 3. Irrigation Water Applied vs. Required - 1955. The amount of water used for irrigation by sub-basins in the 1955 crop season in comparison to the amount required by plants for optimum growth and yields is shown in Figure 3.

Farmers generally follow a rule of thumb of 1 inch per week for all soils and crops. With this practice, oftentimes too much water is applied and is lost to deep percolation when antecedent moisture conditions and the growth stage of plants have not been considered. At other times, the practice of applying 1 inch per week is far short of plant needs. This is especially true during drought periods of long duration.

Irrigation engineers and college extension specialists agreed that enough water should be applied per irrigation to fill the plant root zone to field capacity. Visual inspection of Figure 3 suggests that the total season water application should at least be doubled.

k. Cost of and Return to Irrigation in the Delaware River Basin. One of the objectives of the Delaware River Basin Study is to calculate the value of water for irrigation. This involves collecting, tabulating and analyzing data relating to the kinds of crops irrigated, the response of crop yields to irrigation, prices received, and costs.

Tables 12 and 13 show that, for both potatoes and vegetable crops, the average increase in yields due to irrigation was 34 percent.

The yield response data were collected from controlled

TABLE 4. COMPARISON OF DROUGHT DAYS VS. 20-YEAR AVERAGE
MOORESTOWN, NEW JERSEY - 1956 GROWING SEASON
DELAWARE RIVER BASIN

Months	Water-Holding Capacity in Root Zone at 50 Percent Depletion				
	.5"	1"	2"	3"	4"
	Days	Days	Days	Days	Days
April	8	2	-	-	-
May	18	12	5	-	-
June	12	9	4	-	-
July	14	5	2	2	-
August	22	17	14	14	9
September	19	19	19	19	19
Total Days	93	64	44	35	28
20-Year Average	109	83	58	44	34

TABLE 5. DISTRIBUTION OF DROUGHT DAYS
MOORESTOWN, NEW JERSEY - 1956 GROWING SEASON
DELAWARE RIVER BASIN

Water-Holding Capacity	Duration of Drought in Days					
	1	2-4	5-7	8-10	11-14	15-21
Inches	1/					
.5	6	12	5	-	2	-
1	5	7	3	1	1	-
2	3	4	1	1	1	-
3	2	1	1	1	1	-
4	-	-	1	1	1	-

1/ Figures in these colums represent the number of times specific drought periods occurred during the 1956 growing season.

TABLE 6. DISTRIBUTION OF IRRIGATED CROPS, 1955
DELAWARE RIVER BASIN

Sub-basin	Total Irrigated	Vegetable Crops	Potatoes	Fruits	Field Crop	Hay & Pasture
	Acres	Acres	Acres	Acres	Acres	Acres
1	57	27	-	-	10	20
2	71	32	5	5	12	17
3	158	52	17	30	23	36
4	868	667	23	53	41	84
5	1,076	323	183	195	122	253
6	1,813	1,084	286	141	111	191
7	11,814	9,560	817	758	371	308
8	1,724	410	213	375	287	439
9	5,170	3,747	239	299	537	348
10	20,205	14,933	4,173	203	728	168
Total	42,956	30,835	5,956	2,059	2,242	1,864

TABLE 7. DISTRIBUTION OF IRRIGATED ACREAGE BY ROOT ZONE DEPTHS, 1955
DELAWARE RIVER BASIN

Sub-basin	Total Crops Irrigated	Irrigated Crops by Root Zone Depths			
		Group I 6"-12"	Group II 12"-18"	Group III 18" - 24"	Group IV 24"-36"
	Acres	Acres	Acres	Acres	Acres
1	57	4	23	20	10
2	71	5	27	26	13
3	158	11	71	42	34
4	868	302	200	282	84
5	1,076	69	521	262	224
6	1,813	401	646	576	190
7	11,814	892	3,832	6,565	525
8	1,724	122	739	466	397
9	5,170	410	855	3,014	891
10	20,205	4,223	8,922	6,161	899
Total	42,956	6,439	15,836	17,414	3,267

TABLE 8. DISTRIBUTION OF CROP AND PASTURE ACREAGE, 1955
DELAWARE RIVER BASIN

Sub-basin	Total Acres	Available Water-Holding Capacities Within Root Zone Depths				
		1"	2"	4"	6"	8"
		Acres	Acres	Acres	Acres	Acres
1	57	-	2	14	26	15
2	71	-	3	15	33	20
3	158	-	11	4	78	65
4	868	81	270	121	300	96
5	1,076	-	69	521	68	418
6	1,813	5	322	386	774	326
7	11,814	234	2,576	2,542	5,609	853
8	1,724	-	122	37	823	742
9	5,170	94	1,238	317	2,830	691
10	20,205	1,180	4,630	7,005	6,876	514
Total	42,956	1,594	9,243	10,962	17,417	3,740

TABLE 9. AMOUNT OF WATER USED FOR IRRIGATION, 1955
DELAWARE RIVER BASIN

Sub-basin	Total Acres Irrigated	Av. Amt. Water Appld. Per Season	Total Water Applied
	Acres	Inches	Acre Feet
1	57	4.1	20
2	71	4.1	24
3	158	4.1	54
4	868	4.1	297
5	1,076	4.1	368
6	1,813	4.1	619
7	11,814	4.1	4,036
8	1,724	4.1	589
9	5,170	4.1	1,766
10	20,205	4.1	6,903
Total	42,956		14,676

TABLE 10. SOURCES OF WATER FOR IRRIGATED ACREAGE, 1955
DELAWARE RIVER BASIN

Sub-basin	Amount of Water Used	Surface Water	Ground Water	Municipal Supplies
	Acre Feet	Acre Feet 1/	Acre Feet 1/	Acre Feet 1/
1	20	20	-	-
2	24	24	-	-
3	54	52	2	-
4	297	239	52	6
5	368	358	10	-
6	619	511	101	7
7	4,036	3,123	824	89
8	589	487	97	5
9	1,766	1,469	260	37
10	6,903	5,414	1,400	89
Total	14,676	11,697	2,746	233

1/ Source of water

TABLE 11. ESTIMATE OF WATER NEEDED FOR IRRIGATION, 1955
DELAWARE RIVER BASIN

Sub-basin	Total Acres Irrigated	Available Water-Holding Capacities of Root Zone Depth at 50 Percent Depletion															Total Acre Feet
		.5"			1"			2"			3"			4"			
		Acres	Inches Per Acre	Acre Feet	Acres	Inches Per Acre	Acre Feet	Acres	Inches Per Acre	Acre Feet	Acres	Inches Per Acre	Acre Feet	Acres	Inches Per Acre	Acre Feet	
1	57	-	-	-	2	14	2.3	14	11	12.8	26	9	19.5	15	7	8.8	43
2	71	-	-	-	3	14	3.5	15	11	13.8	33	9	24.8	20	7	11.7	54
3	158	-	-	-	11	14	12.8	4	11	3.7	78	9	58.5	65	7	37.9	113
4	868	81	18	121.5	270	15	337.5	121	12	121.0	300	10	250.0	96	9	72.0	902
5	1,076	-	-	-	69	15	86.3	521	12	521.0	68	10	56.7	418	8	278.7	943
6	1,813	5	18	7.5	322	15	402.5	386	12	386.0	774	10	645.0	326	8	217.3	1,658
7	11,814	234	18	351.0	2,576	15	3,220.0	2,542	12	2,542.0	5,609	10	4,674.2	853	8	568.7	11,356
8	1,724	-	-	-	122	15	152.5	37	12	37.0	823	9	617.3	742	7	432.8	1,240
9	5,170	94	18	141.0	1,238	16	1,650.6	317	12	317.0	2,830	9	2,122.5	691	7	403.1	4,634
10	20,205	1,180	17	1,671.6	4,630	15	5,787.5	7,005	11	6,421.3	6,876	8	4,584.0	514	5	214.1	18,678
Total	42,956																
Acre Feet				2,293			11,655			10,376			13,052			2,245	39,621

TABLE 12. RESPONSE OF IRISH POTATO YIELDS TO IRRIGATION - CONTROLLED EXPERIMENTS BY NEW YORK, NEW JERSEY, AND DELAWARE AGRICULTURAL EXPERIMENT STATIONS, 1938-1956
DELAWARE RIVER BASIN

Unit	State	Year or Years	Type of Soil	Yield, Check Plots	Yield, Irrigated Plots	Increase in Yield	Percent Increase in Yield
Bushel	New York Long Island	1938-45	Silt loam	259	316	57	22*
"	"	1949	Not given	258	459	201	78
"	"	1950	"	537	574	37	7
"	"	1951	"	367	499	132	36
"	Upstate New York	1949	Heavy	416	510	94	23
"	"	1950	"	376	456	80	21
"	"	1951	"	354	392	38	11
"	New Jersey	1946-55	Sassafras loam	213	311	98	46*
"	Delaware	1954	Sandy loam	203	388	185	91
"	"	1955	"	348	428	80	23
"	"	1956	"	364	371	7	2
Weighted average							34

* Average for period

TABLE 13. RESPONSE OF VEGETABLE CROP YIELDS TO IRRIGATION - CONTROLLED EXPERIMENTS BY NEW YORK, NEW JERSEY, AND DELAWARE AGRICULTURAL EXPERIMENT STATIONS, 1948-1956
DELAWARE RIVER BASIN

Name of Crop	Unit	State	Year or Years	Type of Soil	Yield, Check Plots	Yield, Irrigated Plots	Increase in Yield	Percent Increase in Yield
		Upstate						
Snap Beans	Lbs.	New York	1948	Stony loam	4,221	5,891	1,670	40
Snap Beans	"	"	1956	Not given	5,581	5,464	-	-
Peas	"	"	1952-55	"	3,470	4,470	1,000	29
Cabbage	Tons	"	1952-55	"	28.0	33.1	5.1	18
Sweet Corn, in husk	"	"	1952-55	"	4.46	5.85	1.4	31
Sweet Corn, in husk	"	"	1956	"	6.7	6.7	-	-
Cabbage, early	"	New Jersey	1955	Sandy loam	14.8	20.1	5.3	36
Cabbage, early	"	"	1956	"	18.4	24.4	6.0	33
Cabbage, all season	"	"	1955	"	14.8	19.9	5.1	34
Muskmelons	"	"	1955	"	11.9	17.6	5.7	48
Muskmelons	"	"	1956	"	21.6	21.0	-	-
Sweet Corn, in husk	"	"	1955	"	2.11	4.21	2.1	100
Sweet Corn, in husk	"	"	1956	"	5.40	5.59	.19	4
Sweet Corn, in husk	"	"	1949-54	Sassafras loam	5.64	7.72	2.08	37
Lima Beans	Lbs.	Delaware	1953	Silt loam	1,118	2,236	1,118	100
Lima Beans (Thorogreen)	"	"	1955	Loamy sand	2,321	2,371	50	2
Lima Beans (Fordhook)	"	"	1955	"	645	1,096	451	70
Lima Beans (Thorogreen)	"	"	1956	"	571	876	305	53
Lima Beans (Fordhook)	"	"	1956	"	541	954	413	76
Lima Beans	Tons	"	1950	"	1.7	2.4	.7	4.1
Weighted average								34

experiments by the New York, New Jersey, and Delaware Agricultural Experiment Stations. An effort was made to collect data showing crop yield responses on the soils of different water-holding capacities. Available data were inadequate to make this possible. However, the data shown in Tables 12 and 13 apply reasonably well to soil conditions in the Coastal Plain area. The bulk of the irrigation in the Delaware Basin is in this area. These data are substantiated by data from other experiment stations.

Table 14 indicates that the average cost per acre of irrigation for the 1949-55 period was $22.21 annually. These data were collected from cost studies made by 5 state experiment stations. It would have been desirable to have cost data relating to soils of different water-holding capacities. However, size of operation (size of farms and size of fields) is much more important cost-wise than is water-holding capacity of soils, number of times irrigated, amount of water applied per irrigation, and source of water.

Costs and net returns of increased yields due to irrigation are shown in Tables 15 and 16. These tables show for the period 1949-55 that farmers had an average net gain of $62.00 annually per acre due to irrigation. This amount is $65.48 when adjusted for water lift and water storage. Reliable cost data for several of the truck crops were unavailable. Some crops shown have no cost data available. The figure used is the average for all cost data available for truck crops.

In making projections for the future, the long-term projected price is used. No attempt is made to project the effects of technology. (See below, "Adjustments for Cost of Water Lift and Water Storage.")

Tables 17 and 18 show the influence of irrigation on a typical Coastal Plain farm. These tables show that the net value of increased production, due to irrigation for the period 1949-55 on this 170-acre farm, was $5,850 annually. This amount is $6,310 when adjusted for water lift and water storage.

1. Adjustments for Costs of Water Lift and Storage. The cost data presented in the foregoing tables, as previously stated, were obtained from surveys made by nearby state agricultural experiment stations. The data include all costs relating to irrigation on the different farms. If the source of water was from wells, the cost of the water lift was included. If the source was reservoirs or ponds, the cost of the reservoirs or ponds was included.

However, for the purpose of this study, an adjustment in the data was needed. If a series of dams and reservoirs were constructed in the Delaware River Basin, water would be supplied to the different farms through pipes or canals delivered to the edge of the farm at ground level. In this event, farmers would eliminate wells and ponds, and thus the cost

TABLE 14. YEARLY COSTS OF IRRIGATION - STUDIES CONDUCTED BY STATE AGRICULTURAL EXPERIMENT STATIONS
DELAWARE RIVER BASIN

State	Year	Crop	No. of Times Irrigated	Water Per Irrigation	Total Water Applied	Cost Per Acre	Cost Per Acre Inch	Cost per Acre Adjusted to 1949-55 Base	Cost per Acre Adjusted to Long-Term Projected Base [1/]	Source of Data
				Inches	Inches	Dollars	Dollars	Dollars	Dollars	
New Jersey	1955	Vegetables and Potatoes	4.6	1.3	6.0	24.00	4.00	23.52	22.81	Survey of 111 farms
New York Long Island	1946	"	2.0	1.4	2.8	21.43	7.65	28.50	27.64	Survey of 23 farms
Michigan	1953	"	3.0	2.0	6.0	20.96	3.49	20.54	19.92	Synthesized farm organizations
Virginia	1955	"	3.0	2.0	6.0	19.26	3.21	18.87	18.30	"
Delaware	1956	"	1.7	1.4	2.4	26.00	10.83	24.96	24.21	Survey of 56 farms
Delaware	1957	"	2.5	1.5	3.7	18.12	4.88	16.85	16.34	Survey of 121 farms
Average							5.67	22.21	21.53	

1/ 1949-55 base times 97 percent

TABLE 15. GROSS VALUE OF INCREASED PRODUCTION PER ACRE OF CROPS DUE TO IRRIGATION, 1949-55
DELAWARE RIVER BASIN

Name of Crop	Acres	Yield Before Irrigation	Yield After Irrigation	Increased Yield Due to Irrigation [1]	Price Received [3]	Gross Value of Increased Yield
		Cwt.	Cwt.	Cwt.	Dollars	Dollars
Irish Potatoes	7,829	150	201	51	1.97	100
Sweet Corn	4,238	44	59	15	3.77	57
Tomatoes	3,011	95	127	32	5.30	170
Snap Beans	2,921	37	50	13	7.05	92
Spinach	1,746	75	100	25	4.39	110
Lettuce	1,608	154	206	52	4.43	230
Sweet Potatoes	1,592	87	117	30	4.77	143
Cabbage	1,441	154	206	52	2.21	115
Broccoli	1,401	52	70	18	10.23	184
Peppers	1,117	57	76	19	4.86	92
Total	26,904 [2]					

1/ Increased yield due to irrigation, 34 percent
2/ These ten crops constitute 63 percent of the irrigated acreage in the Delaware Basin
3/ New Jersey 1949-55 fresh market prices are taken as average for the Delaware Basin.
Source: 1957 Summary, Commercial Truck Crops for Fresh Market in New Jersey, December 17, 1957, AMS, USDA

TABLE 16. YEARLY COST OF IRRIGATION, AND COST OF HARVESTING, MARKETING AND NET VALUE PER ACRE OF INCREASED YIELDS OF CROPS DUE TO IRRIGATION, 1949-55
DELAWARE RIVER BASIN

Name of Crop	Acres	Labor for Harvesting and Marketing	Containers	Use of Truck on Farm	Irrigation Per Acre Irrigated	Total Cost [1]	Net Value of Increased Production
		Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
Irish Potatoes	7,829	9	9	4	22	44	56
Sweet Corn	4,238	7	5	1	22	35	22
Tomatoes	3,011	21	21	4	22	68	102
Snap Beans	2,921	27	15	1	22	65	27
Spinach	1,746	15	45	2	22	84	26
Lettuce	1,608	7	28	4	22	61	169
Sweet Potatoes	1,592	8	19	2	22	51	92
Cabbage	1,441	8	18	4	22	52	63
Broccoli	1,401	14	32	2	22	70	114
Peppers	1,117	10	27	2	22	62	31
Total	26,904						62 [2]

1/ Costs adjusted to 1949-55 base
2/ Weighted average

TABLE 17. GROSS VALUE OF INCREASED PRODUCTION OF CROPS DUE TO IRRIGATION ON A TYPICAL COASTAL PLAIN FARM, 1949-55 DELAWARE RIVER BASIN

Name of Crop	Crops in Farm	Crops Irrigated	Yield Per Acre Before Irrigation	Yield Per Acre After Irrigation	Increased Yield Due to Irrigation 1/	Price Received 2/	Gross Value Per Acre Irrigated of Increased Yield	Gross Value for Farm of Increased Yield
	Acres	Acres	Cwt.	Cwt.	Cwt.	Dollars	Dollars	Dollars
Irish Potatoes	130	130	150	201	51	1.97	100	13,000
Barley	20	-	-	-	-	-	-	-
Pasture	13	-	-	-	-	-	-	-
Farmstead and Fence Rows	7	-	-	-	-	-	-	-
Total	170	130	150	201	51	1.97	100 3/	13,000 3/

1/ Increased yield due to irrigation, 34 percent
2/ New Jersey 1949-55 prices are taken as average of Delaware Basin
3/ Per year

TABLE 18. COST OF IRRIGATION, AND COST OF HARVESTING, MARKETING AND NET VALUE OF INCREASED YIELDS OF CROPS DUE TO IRRIGATION, 1949-55, ON A TYPICAL COASTAL PLAIN FARM DELAWARE RIVER BASIN

Name of Crop	Crops in Farm	Crops Irrigated	Harvesting Per Acre	Storing and Selling Per Acre	Irrigation Per Acre Irrigated	Total Cost Per Acre	Total Cost for Farm [1]	Net Value per Acre of Increased Yield	Net Value of Increased Yield for Farm
	Acre	Acre	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
Irish Potatoes	130	130	16	15	22	53	6,890	47	6,110
Barley	20	-	-	-	-	-	-	-	-
Pasture	13	-	-	-	-	-	-	-	-
Farmstead and Fence Rows	7	-	-	-	-	-	-	-	-
Total	170	130	16	15	22	53	6,890	47	6,110 [2]

1/ Costs adjusted to 1949-55 base
2/ Per year

data were adjusted by eliminating the costs of water lift from wells and cost of construction for storage in ponds or reservoirs annually.

To accomplish this, data were obtained from one of the state experiment stations, showing costs on 38 farms - 28 with ponds and 10 with wells. For the farms with wells, all costs of wells, pumps and motors relating to water lift were eliminated, including depreciation, repairs and upkeep, interest on capital, and fuel and power. However, costs of water distribution over the farms were retained because these costs would be incurred even though water was delivered to the farm edge. For the farms with ponds, all cost of ponds was eliminated, including depreciation, repairs and upkeep, and interest on capital. However, costs relating to distribution of water over the farms, including surface pumps, motors, interest on capital, and fuel and power were retained for the same reason stated above.

All of these data were weighted in the proportion of 28 farms having ponds as a source of water and 10 farms having wells. It is felt that this proportion applies reasonably well over the entire Delaware Basin.

These data weighted in this proportion show that the average cost of the water lift and the water storage (ponds) was $3.54 per acre irrigated. All dollar values in the foregoing cost data will be reduced by $3.54 per acre and all data showing net values of increased production due to irrigation will be increased by $3.54 per acre.

2-02. FACTORS INFLUENCING EXTENT OF IRRIGATION -- 1955-2060

a. Urban-Industrial Growth and Its Requirement from Cropland. An analysis was made of competing land uses in the region as they exist now and as they probably will change under assumed pressures for specified bench mark periods of the next hundred years. The bases for conclusions and the major conclusions drawn from that study are presented here.

More than a quarter million new homes have been built in the Delaware Basin since the Second World War, and upwards of another quarter million will be added by about 1960. Demands for new space are continuing at an unprecedented rate. Thousands of farm acres are being developed into residential communities, factory sites, trade centers, streets, roadways, turnpikes, airfields, and service areas.

(1) Technology. Adopted technology has resulted in fewer farmers producing more agricultural products. The surplus farm labor force can be utilized effectively only in nonfarm, industrial, trade, and service activities. The established areas of our cities no longer are able to meet needs of the urban population. Urbanized areas must expand. Agriculture's prosperity depends on prosperity of the nonfarm consumer families. We are faced with an urbanized population bursting at its seams.

No one knows what the future will bring. It is, then, only sound judgment to urge that land use changes being made now and in the future be weighed carefully in order that the relative merits of each alternative use create as little irreparable harm as possible to remaining soil productivity. This would allow for bad guessing and would conserve as much of natural resources as is economically feasible for the benefit of future generations.

Most agricultural uses of land are relatively extensive and make comparatively low returns of value per acre. When these values are capitalized into prices farmers can afford to pay for land many other users can afford to pay much higher prices for almost any tract they want. Agriculture becomes a residual claimant -- owners sell to the highest bidder. But technological advances have been such that fewer farmers produce more food on less land than ever before.

(2) Zoning. The purposes, use of, and experience with zoning laws were examined. The principles of what zoning can and cannot do are poorly understood. At best, zoning is a temporary measure no stronger than the will of the residents to make effective use of it. Rural zoning cannot substitute for information and long-range planning.

From a study of literature and of Delaware Basin conditions, urban land use requirements for future populations were assumed to be at the rate of 1/4 acre per capita. Consultation with National Park Service personnel resulted in an assumption of 65 acres of rural park lands per 1,000 population. About 1/4 of this park land would come from cropland although, generally, none of this land would be desirable for irrigation. No useable criteria exist for determining area required for new highways in the future. After review of present standards, plans and criteria, a flat 10 acres per 1,000 additional persons was assumed. It was distributed in the same proportion as lands for parks and playgrounds. It is recognized that some potentially irrigable lands undoubtedly will be affected. Being unable to determine where the roads will be located, their effect on those soil areas cannot be evaluated.

(3) Land Use Trends. Study was made by air photo comparison techniques of the area alienated from agriculture and the quality of soils involved. In addition, the effect on levels of farming remaining in the several communities where urban uses have expanded rapidly since the war were considered. Naturally, variations occurred among these samples, but the distribution of soil quality and former land uses were surprisingly consistent among the several areas. Well-drained cropland was in greatest demand for urban and industrial uses. The potential for irrigation on these lands had been high.

As a result of this study, the following average rates

for future land transfers were developed: 75 percent would come from cropland, 15 percent from pasture, and 10 percent from woods. The proportion of cropland suitable for irrigation to be taken by urban growth was reduced from approximately 75 percent of total cropland to 50 percent. This was done on the basis that future expansions will be forced onto rougher, wetter, stonier and generally less desirable lands, due to economic factors involving distance from urban focal centers and rising land prices. It is assumed, also, that social control eventually will become more effective in putting a brake on some destruction of agricultural potential for food production. Application of the criteria developed above meant that 37-1/2 percent of land requirements for future nonfarm growth would come from irrigable cropland and 62-1/2 percent would be from nonirrigable cropland, pasture, and woods.

(4) Population Growth. The Office of Business Economics, United States Department of Commerce, developed a series of preliminary projections on population, numbers of families, employment, etc., by metropolitan and trade sub-regions for 1955, 1975 and 2010, which were released on November 5, 1957 for use by cooperating agencies. Although minor refinements were provided later, these did not affect our basic calculation. Office of Business Economics made no projections to 2060. A net population increase, one-half as great as the Office of Business Economics assumed between 1955 and 2010, was assumed for the period 2010 to 2060, in order to give perspective to potential drains on agricultural lands and demands for irrigation water during that period. If growth during that period is greater than has been assumed, the area remaining for irrigated crop production will be reduced accordingly.

(5) Irrigable Acreages. The sub-basin metropolitan areas delineated by the Office of Business Economics are a major limiting factor in the projection of land use changes within watersheds. Land quality and use data were correlated to the OBE areas, and nonfarm land withdrawal factors were applied at this level. The remaining areas among the watershed problem areas were redistributed. It is recognized that population is not distributed evenly throughout the several OBE areas, but no other acceptable method for converting land use changes could be developed.

County by county, estimates of potentially irrigable acreages were developed by Soil Conservation Service technicians. These, in turn, were separated by current usage into cropland, idle, pasture, and woodland. Physical soil characteristics, slope, drainage, and nearness to water supply were major factors used in this determination. But a combination of socio-economic conditions, not measurable in dollars, prevents clearing woodland, for example, for irrigated crops in a highly urbanized area. Therefore, of the land suitable for irrigation, it was assumed that one-tenth of the woodland, one-third of the pasture, one-half of the idle, and all of the tilled cropland would be used as the basis for further calculations pertaining to irrigated cropping programs.

Four statistical tables were developed. In Table 19 is shown the net population gains between 1955, 1975, 2010 and 2060. These net gains are used later in Table 21 for projecting nonfarm drain on rural lands.

Table 20 shows the breakdown of county acreages as prepared by the Soil Conservation Service. Land already urban or in rural homesteads obviously is not available for cropping. This was subtracted from the total land areas and the remainder designated as openland. The estimated acreage of irrigable land then was drawn out and the remainder became nonirrigable openland. This step was necessary because rates of land withdrawal for nonfarm purposes are different as was described previously. To recapitulate briefly, it is assumed that all urban uses of land for new population will average one-fourth acre per person; rural area parks and playgrounds will require 65 acres, and new roads and highways will take 10 acres per 1,000 of new population, respectively.

The average per capita factor developed by this method became .269 acre per capita divided into .175 acre from nonirrigable land and .094 acre from irrigable land.

Table 21 shows the procedures used to derive the acreages needed for nonfarm use by 1975. Since area data are unavailable for New York and Connecticut, it is impossible to complete the tabulations for Areas 1 and 2. However, it is obvious that no irrigable land and little other openland will be left for agriculture in these areas by 1975 if present trends continue. Irrigable and openland would remain in most counties in the other metropolitan areas.

Table 22 picks up the projected rural acreages remaining in 1975 and carries the analysis to 2010. Table 23 carries the analysis to 2060.

By 1975, there will be no irrigable land left for farming in Areas 1 and 2. By 2010, all irrigable land in Areas 3, 4 and 5 would be used for nonfarm purposes and much of the urbanization that would have gone on irrigable soils will be forced onto steeper and wetter areas where construction and maintenance costs will be greater. Irrigation agriculture will be forced to the very fringes of the Wilmington metropolitan region as represented by Salem County, New Jersey, and the southern edges of New Castle County, Delaware (Area 6), a few isolated areas of better soils in small valleys and the more level ridgetops in the Upper Basin (Area 7), and the lighter soils of the Southern Basin and Coastal Plain (Area 8).

The assumed decline in net rate of population growth between 2010 and 2060 is reflected in the declining rate of conversions of irrigable lands to urban uses. Pressure would be greatest on farming in the upper Basin area where about one-third of the remaining irrigable

TABLE 19. PROJECTION OF POPULATION GROWTH [1/]
DELAWARE RIVER BASIN AND WATER-DEPENDENT AREAS

Area and Number [2/]	Estimated Population			Population Net Gain [3/]		
	1955	1975	2010	1975/1955	2010/1975	2060/2010
	Thousands	Thousands	Thousands	Thousands	Thousands	Thousands
1. New York City, Metropolitan	13,789	17,360	24,100	3,571	6,740	5,156
2. New York City, Supplement	1,214	1,880	3,740	666	1,860	1,263
3. Bethlehem, Allentown, Reading	795	1,040	1,550	245	510	378
4. Trenton, Metropolitan	249	360	660	111	300	205
5. Philadelphia, Metropolitan	4,108	5,420	8,180	1,312	2,760	2,036
6. Wilmington, Metropolitan	323	490	950	167	460	314
7. Upper Basin	551	680	910	129	230	179
8. Southern Basin and Coastal Area	465	700	1,310	235	610	422
Total	21,494	27,930	41,400	6,436	13,470	9,953

1/ Based on OBE projections

2/ Counties in each area as designated by OBE include:

1. New York City, Suffolk, Rockland, Westchester, New York; and Bergen, Passaic, Essex, Hudson, Union, Middlesex, Morris, Somerset, New Jersey
2. Putnam, Orange, Dutchess, New York; Fairfield, Connecticut; and Monmouth, New Jersey
3. Northampton, Berks, Pennsylvania; and Warren and Hunterdon, New Jersey
4. Mercer, New Jersey
5. Bucks, Montgomery, Chester, Philadelphia, Pennsylvania; and Camden, Gloucester, Burlington, New Jersey
6. Salem, New Jersey; and New Castle, Delaware
7. Delaware, Sullivan, Ulster, New York; Sussex, New Jersey; and Wayne, Pike, Monroe, Carbon, Schuylkill, Pennsylvania
8. Ocean, Atlantic, Cape May, Cumberland, New Jersey; and Kent, Sussex, Delaware

3/ OBE did not project to 2060. Rate was assumed to decline to one-half of the increase between 1955 and 2010.

TABLE 20. IRRIGABLE AND NONIRRIGABLE ACREAGE BY METROPOLITAN AREAS AND COUNTIES 1/
(p. 1 of 4) DELAWARE RIVER BASIN AND WATER-DEPENDENT AREAS

Area	Total Area Classified by SCS Capability	Urban and Homestead	Openland	Irrigable	Nonirrigable
	2/ Acres	Acres	Acres	Acres	Acres
Area 1					
New York City, Suffolk, Rockland, and Westchester, New York	3/ NA	NA	NA	NA	NA
Passaic, Bergen, Essex, and Hudson, N.J.	355,200	191,200	164,000	5,421	158,579
Union, New Jersey	65,920	44,420	21,500	322	21,178
Middlesex, New Jersey	199,680	70,644	129,036	30,254	98,782
Morris, New Jersey	299,520	94,520	205,000	4,868	200,132
Somerset, New Jersey	196,480	22,822	173,658	8,889	164,769
Total (New Jersey portion)	1,116,800	423,606	693,194	49,754	643,440
Area 2					
Putnam, Orange, Dutchess, New York; and Fairfield, Connecticut	NA	NA	NA	NA	NA
Monmouth, New Jersey	305,280	55,029	250,251	89,720	160,531
Total (New Jersey portion)	305,280	55,029	250,251	89,720	160,531

1/ Acreage by SCS capability classes
2/ Except water and marsh areas
3/ Not available

TABLE 20. IRRIGABLE AND NONIRRIGABLE ACREAGE BY METROPOLITAN AREAS AND COUNTIES
(p. 2 of 4) DELAWARE RIVER BASIN AND WATER-DEPENDENT AREAS

Area	Total Area Classified by SCS Capability	Urban and Homestead	Openland	Irrigable	Nonirrigable
	Acres	Acres	Acres	Acres	Acres
Area 3					
Lehigh, Pennsylvania	221,440	14,679	206,761	10,722	196,039
Northampton, Pennsylvania	237,440	15,607	221,833	11,486	210,347
Berks, Pennsylvania	496,640	39,383	457,257	23,492	433,765
Warren, New Jersey	231,040	13,934	217,106	8,915	208,191
Hunterdon, New Jersey	278,400	9,038	269,362	12,601	256,761
Total	1,464,960	92,641	1,372,319	67,216	1,305,103
Area 4					
Mercer, New Jersey	150,511	24,103	126,408	36,879	89,529
Area 5					
Bucks, Pennsylvania	389,760	47,741	342,019	29,803	312,216
Montgomery, Pennsylvania	307,200	56,291	250,909	13,225	237,684
Chester, Pennsylvania	396,160	51,668	344,492	18,547	325,945
Philadelphia, Pennsylvania	NA	NA	NA	NA	NA
Delaware, Pennsylvania	114,560	50,327	64,233	5,942	58,291
Camden, New Jersey	141,440	58,910	82,530	20,289	62,241
Gloucester, New Jersey	210,560	11,283	199,277	64,500	134,777
Burlington, New Jersey	524,160	28,230	495,930	116,201	379,729
Total (except Philadelphia)	2,083,840	304,450	1,779,390	268,507	1,510,883

TABLE 20. IRRIGABLE AND NONIRRIGABLE ACREAGE BY METROPOLITAN AREAS AND COUNTIES
(p. 3 of 4) DELAWARE RIVER BASIN AND WATER-DEPENDENT AREAS

Area	Total Area Classified by SCS Capability	Urban and Homestead	Openland	Irrigable	Nonirrigable
	Acres	Acres	Acres	Acres	Acres
Area 6					
Salem, New Jersey	224,000	17,648	206,352	79,021	127,331
New Castle, Delaware	220,820	76,581	144,239	64,285	79,954
Total	444,820	94,229	350,591	143,306	207,285
Area 7					
Delaware, New York (in Basin)	114,560	50,327	64,233	24,974	39,259
Sullivan and Ulster, New York(in Basin)	1,558,400	49,853	1,508,547	10,439	1,498,108
Sussex, New Jersey	337,920	11,052	326,868	8,661	318,207
Wayne, Pennsylvania	421,055	21,513	399,542	16,136	383,406
Pike, Pennsylvania	341,140	17,605	323,535	3,509	320,026
Monroe, Pennsylvania	386,660	18,255	368,405	6,620	361,785
Carbon, Pennsylvania	258,559	10,835	247,724	5,198	242,526
Schuylkill, Pennsylvania	242,780	9,711	233,069	7,533	225,536
Total	3,661,074	189,151	3,471,923	83,070	3,388,853

TABLE 20. IRRIGABLE AND NONIRRIGABLE ACREAGE BY METROPOLITAN AREAS AND COUNTIES
(p. 4 of 4) DELAWARE RIVER BASIN AND WATER-DEPENDENT AREAS

Area	Total Area Classified by SCS Capability	Urban and Homestead	Openland	Irrigable	Nonirrigable
	Acres	Acres	Acres	Acres	Acres
Area 8					
Ocean, New Jersey	408,960	39,510	369,450	24,925	344,525
Atlantic, New Jersey	368,000	19,900	348,100	27,881	320,219
Cape May, New Jersey	170,880	13,980	156,900	18,865	138,035
Cumberland, New Jersey	321,920	28,899	293,021	75,685	217,336
Kent, Delaware	238,703	3,752	234,951	150,286	84,665
Sussex, Delaware	605,440 4/	10,000 5/	595,440	82,463	512,977
Total	2,113,903	116,041	1,997,862	380,105	1,617,757
Grand Total	11,341,188	1,299,250	10,041,938	1,118,557	8,923,381

4/ 1954 Census for county area. Eighteen percent of county is in Basin. SCS land capability data not available.
5/ Assumed

TABLE 21. NONAGRICULTURAL REQUIREMENTS FROM RURAL LANDS, 1955 - 1975
DELAWARE RIVER BASIN AND WATER-DEPENDENT AREAS

Area 1/	Population Net Gain 1955-75	Irrigable				Nonirrigable				
		Required	Available	Residual	Deficit	Required	Plus Deficit	Available	Residual	Deficit
	Thousands	(.094A)	Acres	Acres	Acres	(.175A)	Acres	Acres	Acres	Acres
1. New York City, Metrop. (New Jersey portion)	3,571	335,674	49,754		285,920	624,925	910,845	643,440		267,405
2. New York City, Metrop. (Supplement -- New Jersey portion)	666	62,604	89,720	27,116		116,550	116,550	160,531	43,981	
Sub-total	4,237	398,278	139,474	27,116	285,920	741,475	1,027,395	803,971	43,981	267,405
3. Bethlehem, Allentown, Reading	245	23,030	67,216	44,186		42,875	42,875	1,305,103	1,262,228	
4. Trenton, Metrop.	111	10,434	36,879	26,445		19,425	19,425	89,529	70,104	
5. Philadelphia, Metrop.	1,312	123,328	268,507	145,179		229,600	229,600	1,510,883	1,281,283	
6. Wilmington, Metrop.	167	15,698	143,306	127,608		29,225	29,225	207,285	178,060	
7. Upper Basin	129	12,126	83,070	70,944		22,575	22,575	3,388,853	3,366,278	
8. Southern Basin and Coastal Area	235	22,090	380,105	358,015		41,125	41,125	1,617,757	1,576,632	
Sub-total	2,199	206,706	979,083	772,377		384,825	384,825	8,119,410	7,734,585	
Total	6,436	604,984	1,118,557	799,493	285,920	1,126,300	1,412,220	8,923,381	7,778,566	267,405

1/ By metropolitan and trade sub-regions

TABLE 22. NONAGRICULTURAL REQUIREMENTS FROM RURAL LANDS, 1975 - 2010
DELAWARE RIVER BASIN AND WATER-DEPENDENT AREAS

Area 1/	Population Net Gain	Irrigable				Nonirrigable			
		Required	Available	Residual	Deficit	Required	Plus Deficit	Available	Residual
	Thousands	(.094A)	Acres	Acres	Acres	(.175A)	Acres	Acres	Acres
1. New York City, Metrop. (New Jersey portion)	6,740	633,560			633,560	1,179,500	1,813,060		
2. New York City, Metrop. (Supplement -- New Jersey portion)	1,860	174,840	27,116		147,724	325,500	473,224	43,981	
Sub-total	8,600	808,400	27,116		781,284	1,505,000	2,286,284	43,981	
3. Bethlehem, Allentown, Reading	510	47,940	44,186		3,754	89,250	93,004	1,262,228	1,169,224
4. Trenton, Metrop.	300	28,200	26,445		1,755	52,500	54,255	70,104	15,849
5. Philadelphia, Metrop.	2,760	259,440	145,179		114,261	483,000	597,261	1,281,283	684,022
6. Wilmington, Metrop.	460	43,240	127,608	84,368		80,500	80,500	178,060	97,560
7. Upper Basin	230	21,620	70,944	49,324		40,250	40,250	3,366,278	3,326,028
8. Southern Basin and Coastal Area	610	57,340	358,015	300,675		106,750	106,750	1,576,632	1,469,882
Sub-total	4,870	457,780	772,377	434,367	119,770	852,250	972,020	7,734,585	6,762,565
Total	13,470	1,266,180	799,493	434,367	901,054	2,357,250	3,258,304	7,778,566	6,762,565

1/ By metropolitan and trade sub-regions

TABLE 23. NONAGRICULTURAL REQUIREMENTS FROM RURAL LANDS, 2010 - 2060
DELAWARE RIVER BASIN AND WATER-DEPENDENT AREAS

Area 1/	Population Net Gain	Irrigable				Nonirrigable			
		Required	Available	Residual	Deficit	Required	Plus Deficit	Available	Residual
	Thousands	(.094A)	Acres	Acres	Acres	(.175A)	Acres	Acres	Acres
1. New York City, Metrop. (New Jersey portion)	5,156	484,664			484,664	902,300	1,386,964		
2. New York City, Metrop. (Supplement -- New Jersey portion)	1,263	118,722			118,722	221,025	339,747		
Sub-total	6,419	603,386			603,386	1,123,325	1,726,711		
3. Bethlehem, Allentown, Reading	378	35,532			35,532	66,150	101,682	1,169,224	1,067,542
4. Trenton, Metrop.	205	19,270			19,270	35,875	55,145	15,849	
5. Philadelphia, Metrop.	2,036	191,384			191,384	356,300	547,684	684,022	136,338
6. Wilmington, Metrop.	314	29,516	84,368	54,852		54,950	54,950	97,560	42,610
7. Upper Basin	179	16,826	49,324	32,498		31,325	31,325	3,326,028	3,294,739
8. Southern Basin and Coastal Area	422	39,668	300,675	261,007		73,850	73,850	1,469,882	1,396,032
Sub-total	3,534	332,196	434,367	348,357	246,186	618,450	864,636	6,762,565	5,937,261
Total	9,953	935,582	434,367	348,357	849,572	1,741,775	2,591,347	6,762,565	5,937,261

1/ By metropolitan and trade sub-regions

land would be taken. How well this area can compete for water in view of the limited number of high value crops adapted to its climate and soils is a matter of some doubt. On the other hand, the evolved water law and rates charged for water, in the meantime, may give riparian and nearby farmers an advantage over those on Coastal Plain soils who must depend on limited surface water, limited sub-surface water, and desalted sea water.

Table 24 summarizes the rural land balance by periods if assumed rates of population growth and of land alienations develop. Under the assumptions developed previously, about 1.1 million acres of potentially irrigable land still were in rural land and available for farming in 1955. By 1975, about 300,000 acres of this will have passed to nonfarm uses and will be lost to subsequent agriculture. By 2010, an additional 365,000 acres would be diverted; and by 2060, only about 350,000 acres of irrigable land would remain for farming. It is estimated that at least half of this remaining balance will be in the Coastal Plain counties and portions of counties adjacent to the Delaware Basin.

Having the physical land available for growing irrigated crops does not mean that all of it will be used in that manner. The adapted crops must be able to pay for the water in competition with other uses. This involves local on-farm production practices and costs. It also involves inter-regional competition as reflected in the wholesale market prices. Another limitation is to be found in the cropping rotations being followed. Current practice and technology require that close-growing, soil-building and green manuring crops be grown some years to preserve tilth and humus levels in the soils. New technologies, such as "mulch tillage" and better fertilizing practices, may well make it feasible to shorten the rotation. But it is hard to visualize a situation where all land potentially irrigable actually would be irrigated every year. A subsequent study of the economics of irrigation will develop this area of the assignment.

A final limitation in use of data in Table 24 should be noted. Areas 3, 4 and 5 are shown as having no irrigable cropland left by 2010. In actuality, this will probably not occur. It is more likely that every county will have a residual of 200 or 300 acres in intensive nursery culture, including greenhouses to service urban homeowners who want plants and shrubs. There probably always will be a small acreage of truck crops for specific markets. Thus, although agriculture, as commonly thought of, will have disappeared from these counties, an average of 250 acres was assumed per county as using water to grow these special crops. Their demand for water probably will be serviced through urban water systems but must be taken into account in the over-all water supply and demand analysis for the Basin and adjacent areas.

b. Availability of Suitable Soils. The suitability of soils for irrigation in the Delaware Basin is determined largely by their physical properties. Their location in relation to water supply and other environmental factors are also considered.

TABLE 24. RESIDUAL LAND AREA BY BENCHMARK PERIODS
DELAWARE RIVER BASIN AND WATER-DEPENDENT AREAS

Area	Irrigable				Nonirrigable			
	1955	1975	2010	2060	1955	1975	2010	2060
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
1. New York City, Metrop. (New Jersey portion)	49,754				643,440			
2. New York City, Metrop. (Supplement -- New Jersey portion)	89,720	27,116			160,531	43,981		
Sub-total	139,474	27,116			803,971	43,981		
3. Bethlehem, Allentown Reading	67,216	44,186			1,305,103	1,262,228	1,169,224	1,067,542
4. Trenton, Metrop.	36,879	26,445			89,529	70,104	15,849	
5. Philadelphia, Metrop.	268,507	145,179			1,510,883	1,281,283	684,022	136,338
6. Wilmington, Metrop.	143,306	127,608	84,368	54,852	207,285	178,060	97,560	42,610
7. Upper Basin	83,070	70,944	49,324	32,498	3,388,853	3,366,278	3,326,028	3,294,739
8. Southern Basin and Coastal Area	380,105	358,015	300,675	261,007	1,617,757	1,576,632	1,469,882	1,396,032
Sub-total	979,083	772,377	434,367	348,357	8,119,410	7,734,585	6,762,565	5,937,261
Total	1,118,557	799,493	434,367	348,357	8,923,381	7,778,566	6,762,565	5,937,261

(1) Coastal Plain Area. In the southern half of the Delaware Basin, the Coastal Plain offers the greatest potential for irrigable soils. The Coastal Plain consists of two major divisions, an inner and an outer area. The occurrence of favorable soil and climatic conditions in the inner area - a zone close to large centers of population - has already led to specialized production of fresh vegetables, fruits and potatoes. It is in this area that much of the present irrigation is being done.

Because of the greater extent of sandy soils, the outer Coastal Plain is droughty and low in fertility. Although both areas have wide flats of wet land, marsh and swamp land is greater in the outer area.

The fringes around the coast bordering in inner and outer areas are tidal marshes, about 30,000 acres in extent. These tidal areas are of very limited use. Small sections have been drained for crop production but the practice is complex and applied to only a very small extent. However, as habitat for fur-bearing muskrat and other wildlife the marshes are very valuable.

The Coastal Plain area is about 1,500,000 acres in size. In addition, there are 1,500,000 acres of Coastal Plain in the water-dependent area of New Jersey.

Penn-Lansdale and Sassafras-Collington soils compose most of the Coastal Plain. Closely associated are the Chester-Manor soil areas.

Level to undulating topography predominates throughout the area. The land bordering the Piedmont Plateau usually has more broken topography and steeper slopes. This same condition is also prevalent on the land adjacent to streams and drainageways. This rougher topography offers less potential for irrigation because of some of the problems associated with steeper slopes, such as uneven moisture distribution and high pumping costs. However, from a physical standpoint, the soils are well suited to supplemental irrigation.

(2) Piedmont Plateau and Ridge and Valley Area. The Piedmont Plateau and Ridge and Valley division is very important agriculturally. Gray-brown podzalics are the principal soils. Associated with them are the red-yellow podzolic soils.

The Piedmont Plateau forms a belt across the Basin from northern Delaware through southeastern Pennsylvania to central New Jersey. The area is about 2,000,000 acres in size, with a high percentage of land in farms. Much of this area has been farmed longer than any other part of the Basin. However, the expansion of suburban residences and industries is consuming large areas of the farmland.

The Chester-Manor soil areas embrace most of the Piedmont in the Pennsylvania-New Jersey-Delaware portion of the Basin.

The Ridge and Valley area forms a block in central New Jersey and eastern Pennsylvania. It is about 300,000 acres in size. Well-drained soils predominate over the entire area, except that area bordering on the streams. The principal soils are Kistler, Norton, Washington, and Weikert. They range from very shallow to deep with the most extensive soils being shallow or only moderately deep. Washington and Norton represent the deep, well-drained soils. Weikert is shallow and well-drained. Kistler is only moderately deep but well-drained.

Available moisture capacity in these soils is variable because of the range in effective depths. Erosion and depletion of organic matter have reduced infiltration and increased runoff. However, there is still rather good recharge of ground supplies and springs are numerous.

Farming is highly developed and rather intensive. Nearby cities provide a good market.

The factors mentioned above and the general suitability of the soils for irrigation give this area a high potential for water use for agriculture.

(3) Triassic Basin. The Triassic Basin is a 600,000-acre area of sandstone and shale stretching through the Piedmont in Pennsylvania and into New Jersey. A very high proportion of the entire area is in farms.

The Penn soils are the most extensive. Most of them are moderately deep, except the Penn shale loam which is shallow and presents important management problems because of this condition. Serious problems are also present in the management of the soils that have impeded internal drainage, such as Readington.

In parts of this Triassic Basin, the shallow soil over solid shale becomes waterlogged during wet seasons but is very droughty at other times because of low total storage capacity. Much of the rainfall is lost because of rapid runoff.

Variations in conditions in an area of this kind make it hard to generalize. There are small areas made up of soils suitable for irrigation. However, the extent of shallow soil along with large areas of poor drainage reduces the importance of this section as a potential for irrigation.

(4) Southern New England Upland and Northern Shale and Limestone Belt. The small area of Southern New England Upland and Northern Shale and Limestone Belt within the Basin in northern New Jersey and eastern Pennsylvania has undulating to rolling topography with moderately steep slopes.

The area rims New York City. Because of the nearness to market, fruit and vegetable production is important. Dairying, however, is the principal type of agriculture because in many places bedrock is so close to the surface it interferes with tillage.

The soils of this area do not offer a very great potential insofar as suitability for irrigation is concerned. Nearness to market does encourage the production of vegetables, and irrigation is being used on these smaller areas. Much of the water is purchased from a municipal water supply.

(5) Limestone Valley Area. The Limestone Valley area around Allentown is a prominent feature of the Delaware River Basin. Principal limestone soils are Duffield and Frankstown, which are deep, well-drained, and of good productivity. Berks soils on the shale belts are shallow and somewhat droughty. Except for the shale belts, soils are generally deep enough to have high available moisture capacity.

In the limestone sections, much of the drainage is underground, and the supply of surface water and easily-obtained ground water is inadequate.

Vegetables, mainly potatoes, and some fruit are the important truck crops. However, dairying predominates.

The area is about 1,200,000 acres in extent. Its soils will respond very favorably to additional water, particularly the shale soils. The main problem is that good sites for surface storage are scarce because of the character of the limestone and shale bedrock.

(6) Pocono-Catskills Area. The Pocono-Catskills area of about 2,300,000 acres makes up the northern third of the Delaware Basin. The soils are mostly shallow to bedrock or hardpan. Only about half of the area is in farms. Dairying is the main type of agriculture. There are small areas where the production of specialty crops, such as cauliflower and spinach, is rather intensive. The area is a popular summer resort and a recreational area.

This area offers the least possibility for irrigation of any of the Basin area. Furthermore, the long steep slopes create an erosion hazard since they pour torrents of water onto cropped fields and poor quality pastures on and near the valley floors.

(7) Summary. The greatest potential of soils suitable for irrigation lies in the Coastal Plain region. This applies to both the Delaware Basin proper and the water-dependent area. Other Basin segments contain soils suitable for irrigation but the areas are much smaller. In still other places, the position both horizontally and vertically, in which the suitable soils lie with regard to water availability and the difficulty of storage, makes extensive expansion in water use unlikely.

Another important factor, in regard to the availability of soils suitable for irrigation, is the urban and industrial expansion occurring in the Basin. This is discussed in the appendix entitled "Use and Management of Land and Cover Resources," the section on "Soils."

c. Frequency of Drought Conditions. Bad droughts are easily recognized and are often several years apart. These so-called bad droughts do not reduce the average yearly crop yield so much as the unrecognized little droughts that occur year after year during the critical time of crop growth. Rainfall may appear to be adequate, but the uneven distribution is noticed by the farmer. Moreover, the runoff from high intensity storms and deep percolation to below the crop root zone deprives the growing plants of a large part of the total rainfall. Associated with rainfall in the consideration of drought is the amount of available moisture that can be stored in the soil. In some seasons plants growing in a sandy soil may be damaged while a silt loam may carry the same plants without damage. Drought periods and their frequency are thus not only a function of rainfall but also of unit moisture-holding capacity of the soil, root zone depth, the plant's transpiration rate, evaporation from the soil, and management practices.

Field capacity is defined as the maximum amount of water that a well-drained soil can retain against the pull of gravity. The permanent wilting point represents the lowest limit to which moisture can be reduced by plants. The difference between these two limits represents the total available moisture that can be stored in the soil and which can be used by the plants.

The method used in determining drought frequency consists of making a daily balance of available soil moisture and noting the number of days on which the supply of available moisture is exhausted. It was assumed that the amount of water in the root zone is at its maximum capacity on April 1. For each day through the crop season a new balance was computed by adding any rainfall that occurred and subtracting the estimated consumptive use by plants. Monthly consumptive values were computed by the Blaney-Criddle method which takes into account temperature, sunshine hours, and crop factors.

Values for maximum moisture storage capacity of the root zone were taken as .5 inch, 1 inch, 2 inches, 3 inches, and 4 inches, representing the available moisture at 50 percent depletion. This is the moisture level at which irrigation is generally started. Daily precipitation was taken from the United States Weather Bureau records. Records for 11 stations in the Basin were taken for a 20-year period. From these data, a frequency distribution was obtained of the total number of drought days during the crop season, April through September.

Drought probability curves were prepared for the sub-basins. These frequency curves are shown in Figures 5 to 12. They give the minimum number of drought days that are to be expected at 9 probabilities, 1 out of 10 years to 9 out of 10 years. One out of 10 years would be a 10 percent chance, or the minimum number of drought days, for 90 percent of the time.

The real impact of drought becomes apparent from the examination of the curves for areas in the Basin. It will be noted that in Figure 5 there is a 10 percent chance of having 110 moisture deficient days for a coarse soil with an available moisture capacity of .5 inches, and as many as 60 days for a soil having 4 inches of available moisture in the plant root zone at 50 percent depletion. This is the minimum irrigation water requirement for the driest 1 year out of 10 by using the data on number of drought days to be expected at the 1 out of 10 odds. Every other year, or 50 percent of the time, there will be 96 drought days in .5 inch soil and 23 drought days for the 4-inch soil capacity.

In meeting irrigation storage requirements for projected acreages in the study area and in view of the heavy investment of land, equipment, crops grown, labor, and other economic considerations, it appears necessary to compute the total water needs based on two probabilities.

The crops grown in Sub-basins 1 to 6 and 8 are mostly hay and pasture, with small acreages of high value truck crops. It is expected that this type of agriculture will continue through 2060. Based on the length of growing season, climatic conditions and economic considerations, the probability of 3 out of 10 years was used in these sub-basins. This would be a 30 percent chance, or the requirement of 70 percent of the time.

In Sub-basins 7, 9, and 10, large acreages of high value crops are grown. Here the farms have a very high investment in initial plantings as well as a heavy investment in land and equipment. Based on these considerations, the water requirement for the probability of 1 year out of 10 was used.

The seasonal irrigation requirement for all sub-basins was estimated by taking into account the range in soil textures and the rooting depth of crops. Since it was not feasible to estimate the acreage of

specific crops to be grown in the various soil textures, a modal soil was assumed for the Basin. This soil was assumed to have a moisture-holding capacity of 4 inches in the crop root zone. Computations for water requirements are on a 50 percent moisture level, or when 2 inches had been removed through evapo-transpiration.

Table 25 gives the net inches of water required for the minimum number of drought days for the selected probabilities. Drought days are converted to inches of water by using an average daily consumptive use figure of .15 inches for the crop season.

d. Improvements in Irrigation Practices. Future irrigation practices are expected to become more scientific than has been practiced in the past. Water has been one of the limiting factors in plant growth; but with irrigation, fertilizers placed in the soil are available at once to plants since moisture is always present. Under these conditions, irrigators can increase plant population and fertilizer application to the maximum, which usually results in larger harvests.

Farmers realize the importance of knowing when to start irrigating and how much water to apply. Many farmers have purchased rain gages to measure the precipitation falling on their land. Instruments have been developed that help the irrigator determine the moisture content of his soil. These moisture measuring devices are constantly being improved. A few large-scale irrigators in the Basin are using a daily budget system, by adding rainfall and subtracting the daily evapo-transpiration to guide them in irrigation practices. Instrumentation necessary to get all the factors needed to use the budget system for moisture control becomes somewhat complicated. The daily moisture used by plants is based on many factors, such as solar radiation, temperature, wind velocities, humidity, and hours of sunshine. These climatological data could be combined into a value for different areas within the Basin and reported daily to irrigators. This information could then be used in the budget system for more scientific irrigation practices.

Frost protection with sprinkler irrigation on selected crops is being practiced in several states outside the Basin with considerable success. It has been used in the Coastal Plain areas in the Basin to a limited extent. As more knowledge is gained, it is expected that more and more farmers will use irrigation for frost protection of high value crops during the early spring and late fall. Water for this purpose has not been taken into account in the determination of water requirements or the computation of irrigation benefits within the Basin.

e. Irrigated Acreage. Below is an explanation of procedures used in the development of data on irrigable acres by sub-basins for

TABLE 25. WATER REQUIREMENTS FOR IRRIGATION - SEASONAL
DELAWARE RIVER BASIN

Sub-basin	Probability Years	Inches 3/
1	3/10 1/	8
2	3/10	8
3	3/10	8
4	3/10	9
5	3/10	9
6	3/10	9
7	1/10 2/	12
8	3/10	9
9	1/10	12
10	1/10	12

1/ Three years in 10 years represents the driest 3 years in a ten-year period, or the water requirements for 70 percent of the time.
2/ One year in 10 years represents the driest 1 year in a 10-year period, or the water requirements for 90 percent of the time.
3/ Based on the number of drought days after 2 inches of available soil moisture has been removed by evapo-transpiration.

the Delaware River Basin study.

(1) Potential Irrigable Acreage. Maximum potential irrigable acreage was derived by considering the physical properties of the soil and its nearness to water in Land Use Capability Classes I, II, and III for each county in the Delaware Basin (Fig. 15).

(2) Probable Irrigable Acreage. Maximum probable irrigable acreage was developed by estimating the maximum potential acreage and reducing this figure by a judgment factor which involved the use of one-tenth of the woodland, one-third of the pasture, one-half of the idle cropland, and all of the cropland in the three capability classes mentioned above. After applying this judgment factor, the result was what is called "maximum probable irrigable acreage."

The maximum probable acreage by county was broken down percentagewise for areas in the Basin for the year 1955. The Basin was broken down into sub-basin totals to give irrigable acres for the sub-basins.

The Office of Business Economics estimated population growth for the period 1955-1975, and the estimated acreage required was applied to the 1955 probable irrigable acreage for the expansion. This resulted in the probable irrigable acreage available for 1975.

The percentage of each county lying in each of the several sub-basins was determined to obtain the sub-basin total figure.

For the years 2010 and 2060, these same procedures were followed to arrive at the totals for the sub-basins.

Population is not spread uniformly throughout an area or a region. Future urban expansion also will be distributed unevenly throughout the Delaware Basin, its several smaller watersheds, and its numerous minor civil divisions. Limitations of the available data on present distribution, as well as the vagaries of human nature; the chance development of major new employment opportunities; the chance locations or relocation of major transportation facilities; and many other imponderables, make it impossible to locate future urban growth for areas smaller than the major metropolitan regions as defined and used by OBE in its projections.

The section on urban and industrial growth indicates that between 1975 and 2010 nonfarm land uses will have absorbed all of the probable irrigable acres in several entire OBE metropolitan areas.

It is assumed, however, that certain intensive agricultural enterprises, such as nurseries, greenhouses, etc., will persist in an otherwise urban area.

It is estimated that such areas will be approximately 250 acres per county. This has been included in the acreage for each county for the several time intervals.

f. Projected Probable Irrigated Acreage - 1975, 2010 and 2060. Table 26, based on the above assumption, shows the calculated projected probable irrigated acreage for 1975, 2010 and 2060 inside the Basin. The acreages projected are limited to potatoes and vegetable crops. The basis for this procedure is the data contained in Tables 15, 16, 29 and 30, which show that the crops comprising the 10 largest acreages are potatoes and vegetable crops. These tables show that, for the current 1949-55 period, average net gain per acre for these crops, due to irrigation, was $61.94 per acre and that the long-term projected average net gain is $42.06 per acre, exclusive of the cost for delivering water to the farm. These 10 crops comprise 63 percent of the irrigated acreage in the Delaware Basin. It is of significance, as will be shown in the following paragraph, that 86 percent of the acreage irrigated in 1955 was potatoes and truck crops. Apparently farmers have found, through the process of trial and error, that it pays to concentrate water, labor and equipment resources on the high-acre-value potato and vegetable crops rather than spread their resources over a larger acreage, including pasture, hay, and grain crops. As urbanization encroaches more and more on agricultural land, there will be a resulting rise in land values. It is probable that the resultant increasing economic pressure will tend to concentrate irrigation resources on the high-acre-value crops.

(1) Procedure. The following is a brief description of the procedure used in making the projections for the Basin as a whole:

The trend of irrigation shows a rapid increase in recent years. Since the period of rapid increase represents a relatively short period, it was concluded that the recent trend could not be used entirely to indicate the expansion of irrigation.

In 1955, approximately 86 percent, or 37,000, of the irrigated acres in the Basin was used for commercial vegetable production. Since the major use of irrigated acres will probably continue to be used for commercial vegetable production, a study was made of the production trend for vegetables. Information shown in Figure 14, for the State of New Jersey, indicates that acres of vegetable crops are declining while the total production is slightly upward. Production is being maintained by higher yields resulting from irrigation and improved management.

In view of the trend in New Jersey, and knowledge of recent changes in land use for other parts of the Basin, it was assumed that commercial vegetable acres in the Basin (246,000 in 1955) would not increase by 1975.

Based on projected growth of population in the Basin

TABLE 26. ESTIMATED PROJECTED PROBABLE IRRIGATED ACREAGE, 1975, 2010 AND 2060 DELAWARE RIVER BASIN

Sub-basin	1955	1975	2010	2060
	Acres	Acres	Acres	Acres
1	57	600	600	600
2	71	300	300	300
3	158	600	600	600
4	868	3,500	3,500	3,500
5	1,076	5,000	5,000	5,000
6	1,813	8,000	8,000	8,000
7	11,814	28,000	29,000	31,000
8	1,724	3,000	3,000	3,000
9	5,170	20,000	21,000	25,000
10	20,205	60,000	61,000	65,000
Total	42,956	129,000	132,000	142,000

and the trend of commercial production in the United States and New Jersey, an estimated increase above 1955 production of 15 percent was estimated for the Basin in the year 1975. The present production of 803,000 tons of commercial vegetables in the Basin is projected to increase 15 percent, or 120,000 tons, by the year 1975. Studies indicate that yields can be increased 1.5 tons per acre. Therefore, increased production can be obtained with this yield increase on 80,000 acres. Acres of commercial vegetable crops irrigated in the Basin are 37,000. This, plus the 80,000 additional acres of potatoes and vegetables expected to be irrigated, equals the 117,000 acres estimated to be irrigated in 1975.

Irrigation of other crops in the Basin in 1955 was 6,000 acres, or 14 percent of the total. It was assumed that irrigation of these crops would increase to 12,000 acres by 1975. The total projected irrigated acres in 1975 is 117,000 commercial vegetables plus 12,000 other minor crops, or a total of 129,000 acres. In addition, it is estimated there will be approximately 250 acres of irrigated greenhouse and nursery crops in otherwise urban counties.

The projections for the individual sub-basins are the result of judgments of the best informed technicians in this field. The judgments are based largely on (1) type of farming; (2) type of soils; (3) topography; and (4) climate. It was the combined judgment that the proportion of the probable irrigable land of the sub-basins of the Mountain and Piedmont areas that would be irrigated would be appreciably less than in the Coastal Plains. Dairying is the predominant type of farming in the northern sub-basins, and dairymen grow largely low-acre-value grain and hay crops which normally do not respond economically to irrigation. On the other hand, high-acre-value potatoes and vegetable crops are the important crops in the Coastal Plains. The heavy soils in the northern sub-basins are not well suited for vegetable crop production, whereas the light soils of the Coastal Plains are well suited for vegetable crops. Likewise, the topography and climate in the northern sub-basins are not as well suited for vegetable crop production and irrigation as in the Coastal Plain area.

g. Sources of Water for Projected Irrigation - 1975, 2010 and 2060. The estimated water requirements in acre-feet by sub-basins are shown in Table 27. These estimates were then projected as to possible sources of supply for 1975, 2010 and 2060 (Table 28).

In making this projection, the present water sources for 1955, which were obtained from a field study, were used as a guide. A reconnaissance was also made in each county to determine the acreage that could be irrigated from streams and other sources. The low flow water cross section on streams for June, July, and August was estimated. The water flow during these months was computed by assuming a velocity of 1-1/2'/sec. One-half of the computed flow was assumed to be available

TABLE 27. WATER USE FOR IRRIGATION AND REQUIREMENTS
FOR PROJECTED IRRIGATION ACREAGES
DELAWARE RIVER BASIN

Sub-basin	1955 1/	1975	2010	2060
	Actual Water Use			
	Acre Feet	Acre Feet	Acre Feet	Acre Feet
1	20	400*	400*	400*
2	24	200*	200*	200*
3	54	400*	400*	400*
4	297	2,600*	2,600*	2,600*
5	368	3,800*	3,800*	3,800*
6	619	6,000*	6,000*	6,000*
7	4,036	28,000**	29,000**	31,000**
8	589	2,200*	2,200*	2,200*
9	1,766	20,000**	21,000**	25,000**
10	6,903	60,000**	61,000**	65,000*
Total	14,676	123,600	126,600	136,600

1/ Actual water used based on a judgment factor after analyzing results of the field survey
* 3 years in 10
** 1 year in 10

TABLE 28. SOURCES OF WATER FOR IRRIGATION IN 1955, AND POSSIBLE SOURCES OF WATER FOR PROJECTED IRRIGATION DELAWARE RIVER BASIN

Sub-basin	1955 [1]			1975 [2]		
	Total Irr. Water	Surface Water	Ground Water	Total Irr. Water	Surface Water	Ground Water
	Acre Feet	Acre Feet	Acre Feet	Acre Feet	Acre Feet	Acre Feet
1	20	20	-	400	400	-
2	24	24	-	200	200	-
3	54	52	2	400	350	50
4	297	239	58	2,600	2,200	400
5	368	358	10	3,800	3,000	8,000
6	619	511	108	6,000	4,500	1,500
7	4,036	3,123	913	28,000	20,000	8,000
8	589	487	102	2,200	1,500	700
9	1,766	1,469	297	20,000	16,000	4,000
10	6,903	5,414	1,489	60,000	10,000	50,000
Total [3]	14,676	11,697	2,979	123,600	58,150	65,450

	2010 [2]			2060 [2]		
1	400	400	-	400	400	-
2	200	200	-	200	200	-
3	400	350	50	400	350	50
4	2,600	2,200	400	2,600	2,200	400
5	3,800	3,000	800	3,800	3,000	800
6	6,000	4,500	1,500	6,000	4,500	1,500
7	29,000	20,000	9,000	31,000	20,000	11,000
8	2,200	1,500	700	2,200	1,500	700
9	21,000	16,000	5,000	25,000	18,000	7,000
10	61,000	11,000	50,000	65,000	11,000	54,000
Total [3]	126,600	59,150	67,450	136,600	61,150	75,450

1/ Actual irrigation water used based on field survey
2/ Based on probability of 3 years in 10 for Sub-basins 1 to 6 and 8 and 1 year in 10 for Sub-basins 7, 9 and 10
3/ All values in acre-feet per year

to riparian owners for irrigation. Allowing 10 gpm for each acre of irrigation, the total acreage that could be irrigated from streams was computed.

The availability of ground water in the Basin was taken from geology reports, maps, well records, and consultation with state geologists. Estimate of farm and natural, or constructed, storage is based on experiences of Soil Conservation Service personnel located in the study area.

h. Costs and Returns Related to Increased Yields Due to Irrigation.

(1) Procedure. The limited applicable research available seems to indicate that crop yields are increased about 34 percent on an average by irrigation (Table 13).

The average, long time, expected, annual gross returns attributable to irrigation are derived by multiplying the yield increases by projected long-term prices received. The weighted average, gross value increase per acre of major crops irrigated, as listed in Table 29, was $89.00. The average cost of irrigating these crops by present methods, when adjusted for long-term price changes, was calculated to be $21.53 per acre. (Table 14) This was rounded to $22.00 (Table 30) and added to other costs resulting from the increased crop adjusted for trends. The resulting weighted average cost of the increased productivity was $50.80.

The net value per acre of increased production due to irrigation for the future long run term, thus, becomes $38.00.

It was calculated that farmers have an average of $3.54 per acre irrigated invested in pumps and water storage structures to deliver water at field boundary at zero pressure. (Pages 20 and 26) Since this expense would not occur if farmers were using water from a project, the on-farm cost of irrigating would be reduced by that amount in those cases, or one could say that net value of production would be increased from $38.00 to $42.00 per acre.

This figure represents the maximum value of a water storage project to farmers for irrigation purposes. For a particular farm, the cost of irrigation water must be deducted to determine the net profits and returns to management.

The value of water per acre inch will vary widely from year to year depending on the degree of drought, the amount of water applied, and the relative effect of these factors on crop production and commodity prices.

Coastal Plain soils with average water-holding capacity

TABLE 29. GROSS VALUE OF INCREASED PRODUCTION PER ACRE OF CROPS DUE TO IRRIGATION
DELAWARE RIVER BASIN

Name of Crop	Acres	Yield Without Irrigation	Yield With Irrigation	Increased Yield Due to Irrigation	Unit Price 1/	Gross Value of Increased Yield
		Cwt.	Cwt.	Cwt.	Dollars	Dollars
Irish Potatoes	7,829	150	201	51	1.75	89
Sweet Corn	4,238	44	59	15	2.79	42
Tomatoes	3,011	95	127	32	3.92	125
Snap Beans	2,921	37	50	13	5.22	68
Spinach	1,746	75	100	25	3.25	81
Lettuce	1,608	154	206	52	3.28	171
Sweet Potatoes	1,592	87	117	30	3.10	93
Cabbage	1,441	154	206	52	1.64	85
Broccoli	1,401	52	70	18	7.57	136
Peppers	1,117	57	76	19	3.60	68
Total	26,904					

1/ Prices adjusted to long-term projected period.
Source: Agricultural Price and Cost Projections, ARS-AMS, USDA, September 1957

TABLE 30. COST OF IRRIGATION [1/] AND NET VALUE PER ACRE [2/] OF INCREASED YIELDS
DELAWARE RIVER BASIN

Name of Crop	Acres	Labor for Harvesting & Marketing	Containers	Use of Truck on Farm	Irrigation Per Acre Irrigated	Total Cost [3/]	Net Value of Increased Production
		Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
Irish Potatoes	7,829	11	8	1	22	40	49
Sweet Corn	4,238	9	5	*	22	34	8
Tomatoes	3,011	26	20	1	22	65	60
Snap Beans	2,921	34	14	*	22	64	4
Spinach	1,746	18	41	1	22	79	2
Lettuce	1,608	9	25	1	22	56	115
Sweet Potatoes	1,592	10	17	*	22	47	46
Cabbage	1,441	10	16	*	22	46	39
Broccoli	1,401	16	30	1	22	68	68
Peppers	1,117	13	23	1	22	56	12
Total	26,904						38 [4/]

1/ Includes cost of harvesting and marketing. Field studies do not indicate increased fertilizer costs.
2/ Yields of crops due to irrigation.
3/ Costs adjusted to long-term period.
Source: Agricultural Price and Cost Projections, ARS-AMS, USDA
4/ Weighted average
* Less than $.50

of 2 or 3 inches apparently need about 8 inches of supplemental irrigation annually, at the 5 in 10 probability level at 50 percent depletion. The average long-term projected net gain per acre-inch of water under this situation would be $5.26. Data are too sparse to provide safe guides for soils with available water-holding capacities of 1 and 4 inches in the root zone, respectively, but it is probable that the net gains would not be greatly different. Because of the greater incidence of water deficiency, a Coastal Plain soil with 1/2 inch available water-holding capacity at 50 percent depletion will require 16 inches of irrigation at the 5 in 10 probability; however, the increase in yields resulting will be much greater. Conversely, the soils with 4 inch available water-holding capacity at 50 percent depletion require only about 6 inches of water at this probability level, but the increase in yield due to irrigation would be less than on the lighter soils.

These cost data apply only to the Coastal Plain area because, essentially, this is the area where irrigation is practical and high value crops are produced. Of the 42,956 acres irrigated in the Basin in 1955, more than 90 percent was in the Coastal Plain area. In view of the limited acreage irrigated in the northern sub-basins, it is probable that available data would be inadequate for a satisfactory cost study.

(2) Influence of Irrigation on Net Returns of a Typical Coastal Plain Farm. Tables 31 and 32 show that the annual net value of increased production, due to irrigation, for the long-term projected period on this farm would be $8,892. When adjusted for lift and water storage, the figure is $9,438. It is assumed that during the projected period the farm would increase in size from 170 acres to 200 acres. Thirty additional acres would be brought under irrigation.

2-03. RURAL RESIDENTIAL USES OF WATER

a. Amount Used - 1955. A study was made of per capita uses of water for domestic purposes. Included were farms as well as rural homes in the Basin and water-dependent areas. In this survey, an effort was made to list the different water-using appliances and to get an estimate of the frequency of their use as well as the number of persons served. The uses consist of sanitary domestic, washing machines, dishwashers, disposal (waste), car washing, and lawn sprinkling. In making this enumeration, it was necessary to estimate the amount of water used since very few rural residences were on metered service. Water companies supplying urban developments were also contacted to get the average per capita use per service as a basis for estimating rural uses.

This survey showed that there is a wide range in the amount of water used by residences. Quantity used depends largely on the convenience of the source of supply. For example, a Delaware Geological Survey bulletin states, "In northern Delaware, water use has been calculated to

TABLE 31. GROSS VALUE OF INCREASED PRODUCTION OF CROPS 1/
DELAWARE RIVER BASIN

Name of Crop	Crops in Farm Now	Crops in Farm, Long-Term Period	Crops Irrigated Now	Crops Irrigated, Long-Term Period	Yield Per Acre Before Irrigation	Yield Per Acre After Irrigation	Increased Yield Per Acre due to Irrigation	Price Received 2/	Gross Value Per Acre of Increased Yield	Gross Value for Farm of Increased Yield on 130 Acres	Gross Value of Production on 30 Acres	Gross Value of Increased Production for Farm
	Acres	Acres	Acres	Acres	Cwt.	Cwt.	Cwt.	Dollars	Dollars	Dollars	Dollars	Dollars
Irish Potatoes	130	160	130	160	150	201	51	1.75	89	11,570	10,552	22,122
Barley	20	20										
Pasture	13	13										
Farmstead and Fence Rows	7	7	—	—	—	—	—	—	—	—	—	—
Total for Farm	170	200	130	160	150	201	51	1.75	89	11,570	10,552	22,122

1/ On a typical, irrigated Coastal Plain farm, assuming that the farm would increase in size from 170 acres to 200 acres during the projected period
2/ Prices adjusted to long-term projected period. Source: Agricultural Price and Cost Projections, ARS - AMS, USDA

TABLE 32. COST OF IRRIGATION[1] AND NET VALUE OF INCREASED PRODUCTION OF CROPS[2]
DELAWARE RIVER BASIN

Name of Crop	Crops in Farm Now	Crops in Farm, Long-Term Period	Harvesting Per Acre	Storing and Selling Per Acre	Irrigation Per Acre Irrigated	Total Cost Increased Yield Per Acre	Total Cost of Increased Yield for Farm, 160 Acres	Cost of Producing Additional 30 Acres	Total Cost,[3] Producing, Irrigating, Harvesting, and Marketing for Farm	Net Value of Increased Production for Farm
	Acres	Acres	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
Irish Potatoes	130	160	15	14	22	51	8,160	5,070	13,230	8,892
Barley	20	20								
Pasture	13	13								
Farmstead and Fence Rows	7	7	—	—	—	—	—	—	—	—
Total for Farm	170	200	15	14	22	51	8,160	5,070	13,230	8,892

1/ Includes cost of harvesting and marketing
2/ On typical, irrigated Coastal Plain farm, assuming that the farm would increase in size from 170 acres to 200 acres during the projected period
3/ Cost adjusted to long-term projected period. Source: Agricultural Price and Cost Projections, ARS - AMS, USDA

be about 35 gallons per day per person where the water is readily available. It is believed that this figure may be applied throughout the state where wells are equipped with electric pumps. Where water has to be pumped by hand, the use of water is not nearly so great, probably about 7 gallons per person per day. In New Castle County, Delaware, 12 percent of the people who are not served by a public water supply do not have running water. In Sussex County, the figure is 38 percent, and in Kent County, it is 47 percent."

In 1955, rural residents in the Basin used 32 gallons of water per capita per day and 37 gallons per capita per day in the water-dependent areas. More water is used for sanitary purposes than for all other purposes combined. Next is water used for laundry. Lawn sprinkling is third.

Since the pumpage for rural domestic uses is not measured, it was necessary to estimate the amount of water used for this purpose by calculating the number of residences not served by public water supply companies.

As a basis for this estimate, several water companies were contacted to obtain the figures they used in estimating water use per service. The figures obtained were 50 gallons per day per capita, 3.6 persons per residence, and 66,000 gallons per year per residence.

The total population given in the 1950 Census was tabulated by counties. A county tabulation was also made of the public water supply companies and their daily pumpage. Population served by public water supply was computed by using average figures obtained from water companies. The difference between the total county population and the computed urban population represents the rural population. The rural population was then adjusted to 1955 and distributed to the sub-basins and water-dependent areas.

The total amount of water used was obtained by multiplying the calculated rural population by the daily per capita use in the Basin and water-dependent areas. The number of rural residences was calculated by using 3.6 persons per residence.

Table 33 shows the amount of water used for rural residential purposes in 1955 by sub-basins. The average annual use per residence was estimated to be approximately 42,000 gallons. The estimated total residential water used in the Basin is 10,689.6 million gallons.

(b) Future - 1955 to 2060. It was assumed that the number of rural people dependent upon private water sources would remain the same and that the increased number of total households would be served by water companies. The increase in the number of city-employed rural residents is expected to offset the decrease in the number of farm residents.

TABLE 33. WATER USE FOR RURAL RESIDENTIAL PURPOSES, 1955
DELAWARE RIVER BASIN

Sub-basin	Rural Residences	Annual Use Per Residence	Total Residential Use
	Number	Thousand Gallons	Million Gallons
1	2,450	57.9	142
2	3,723	58.4	217
3	11,588	46.4	538
4	7,345	43.2	317
5	18,998	46.3	880
6	24,317	40.0	973
7	47,902	44.6	2,136
8	52,153	36.9	1,924
9	61,218	39.9	2,443
10	22,301	50.2	1,120
Total	251,995		10,690

The average annual use per residence is 42,400 gallons

The increase in the number of city-employed rural residents has come about, largely, through improved transportation. The decrease in the number of rural residents has come about, in part, through farm technology. Also, the relatively high city wages are attracting a large number of young farm workers away from farms.

It was assumed that more and more of the rural residences will be equipped with modern conveniences. On this basis, the amount of water consumed by residences within the study area will approach 100,000 gallons per year by 1975 and will remain the same through 2060. Table 34 shows the estimated future rural residential uses of water in the Delaware Basin.

2-04. WATER FOR LIVESTOCK AND AGRICULTURE OTHER THAN IRRIGATION

a. Amount Used - 1955. As a basis for estimating the amount of water used by livestock and agriculture other than irrigation, a study was made in several counties in the Basin and water-dependent areas. This information was tabulated and used as a guide in setting up Table 35, which shows the average amounts of water consumed per animal unit and rates used for other purposes.

The greatest use is for livestock watering. Under other uses are included such items as, washing dairy equipment, cooling milk, cleaning dairy barns and poultry houses, and spraying crops for weed and disease control.

The number of livestock and dairy farms was obtained from the 1954 Census of Agriculture. The livestock usage was calculated by multiplying the number of each type of livestock by the figures shown in Table 35. The amount of water under other uses was obtained by multiplying the number of dairy and hog farms by the amounts suggested for this purpose.

Table 36 shows the amount of water used for livestock and other uses in the Delaware Basin. Table 37 shows the sources of supply.

b. Future - 1955 to 2060. The rate of water consumption by livestock and other uses is expected to increase slightly by 2060. It is estimated that the number of dairy cows will increase by 20 percent during this period in the Piedmont and Mountain areas of the study areas. It is estimated there will be no change in the dairy cow numbers in the Coastal Plain area.

Milk production is expected to increase 10 percent per dairy cow, on the average, through the Delaware Basin and water-dependent areas. A 20 percent increase is expected in the number of poultry produced in the Coastal Plain area.

TABLE 34. RURAL RESIDENTIAL USES OF WATER, 1975, 2010 AND 2060
DELAWARE RIVER BASIN

Sub-basin	Rural Residences	Annual Use Per Residence	Total Residential Use
	Number	Thousand Gallons 1/	Million Gallons
1	2,450	100,000	245
2	3,723	100,000	272
3	11,588	100,000	1,159
4	7,345	100,000	735
5	18,998	100,000	1,900
6	24,317	100,000	2,432
7	47,902	100,000	4,790
8	52,153	100,000	5,215
9	61,218	100,000	6,122
10	22,301	100,000	2,230
Total	251,995		25,100

1/ Average 76 gallons/day capita and 3.6 persons/residence

TABLE 35. APPROXIMATE DAILY WATER NEEDS FOR LIVESTOCK AND OTHER FARM USES DELAWARE RIVER BASIN

Livestock:	
Dairy Cows:	
Ordinary dairy herd (dry and producing cow)	15 gal. per cow
High-producing cows (12 gal. of milk or more per day)	35 gal. per cow
Beef Cattle	12 gal. per head
Hogs	4 gal. per head
Sheep	1-1/2 gal. per head
Horses and Mules	12 gal. per head
Chickens (Layers and Broilers)	6 gal. per 100 birds
Ducks	22 gal. per 100 birds
Turkeys	18 gal. per 100 birds
Other Uses:	
Dairy Utensil Washing	30 - 50 gal.
Flushing Dairy Barn	30 - 50 gal.
Sanitary Hog Wallow	100 - 400 gal.

TABLE 36. LIVESTOCK AND OTHER AGRICULTURAL WATER USE, 1955 1/
DELAWARE RIVER BASIN

Sub-basin	Livestock	Other Uses	Total Per Year
	Million Gallons	Million Gallons	Million Gallons
1	270	47	317
2	336	57	393
3	443	120	563
4	296	59	355
5	196	83	279
6	446	122	568
7	410	169	579
8	585	137	722
9	614	182	796
10	487	212	699
Total	4,083	1,188	5,271

1/ Does not include irrigation

TABLE 37. SOURCES OF WATER FOR LIVESTOCK AND OTHER AGRICULTURAL USE, 1955[1/]
DELAWARE RIVER BASIN

Sub-basin		Ground Water	Surface Water	Total
		Million Gallons	Million Gallons	Million Gallons
1	Livestock	254	16	
	Other	45	2	
	S/Total	299	18	317
2	Livestock	259	77	
	Other	33	24	
	S/Total	292	101	393
3	Livestock	301	142	
	Other	117	3	
	S/Total	418	145	563
4	Livestock	184	112	
	Other	53	6	
	S/Total	237	118	355
5	Livestock	152	44	
	Other	68	15	
	S/Total	220	59	279
6	Livestock	295	151	
	Other	107	15	
	S/Total	402	166	568
7	Livestock	354	56	
	Other	159	10	
	S/Total	513	66	579
8	Livestock	429	156	
	Other	132	5	
	S/Total	561	161	722
9	Livestock	512	102	
	Other	166	16	
	S/Total	678	118	796
10	Livestock	444	43	
	Other	204	8	
	S/Total	648	51	699
	Total	4,268	1,003	5,271

1/ Does not include irrigation

No significant change is anticipated in poultry numbers in the remainder of the Delaware Basin and dependent areas.

Table 38 shows the projected water use for livestock and agricultural purposes other than irrigation within the Basin. The amount of water consumed in 1955 by each type of livestock in each area was calculated. The proportionate increase in water use, due to increase in livestock use and livestock production, was calculated for each type of livestock and for each area.

PART III - SUMMARY

Table 39 presents data on the projected future rural water use within the Delaware Basin. Uses include irrigation, rural residence, livestock, and other.

In summary, the following conclusions can be drawn from a study of the tables:

It is estimated that rural water needs for the area within the Basin will rise approximately 250 percent between 1955 and 1975. This expected increase is accounted for principally by a substantial increase in the need for irrigation water. In 1955, irrigation needs were approximately 23 percent of the total water use for all purposes. Rural residence uses were approximately 52 percent of the total. In 1975 the needs will be approximately 57 percent and 35 percent of the total, respectively.

Widespread use of irrigation is comparatively new in the East; more and more of the progressive farmers are learning of the advantages of irrigation. This will result in increased use of irrigation wherever and whenever it is found economically possible.

From 1975 to 2060, there is a slight increase in water needs. Here again, the trend is influenced by irrigation water needs. Although the rural residential and "other" needs remain the same, there is a slight increase in livestock needs. Rural residence needs are approximately 33 percent of the total, and irrigation represents approximately 60 percent of the total.

Water for future irrigation requirements, as shown in Table 39, can be provided for by developing present sources of supply, both ground water and surface water. This determination is based on the assumption that water supplies will not be pre-empted for other uses. Surface supplies may be supplemented by use of the small dams discussed in the Upstream Auxiliary Reservoir appendix.

Any potentials which might result from Corps of Engineers' structures on the mainstem have not been considered in this section of the report.

TABLE 38. PROJECTED WATER USE - LIVESTOCK AND AGRICULTURAL PURPOSES[1/]
DELAWARE RIVER BASIN

Sub-basin	1955			1975		
	Livestock	Other Uses	Total Per Year	Livestock	Other Uses	Total Per Year
	Million Gallons	Million Gallons	Million Gallons	Million Gallons	Million Gallons	Million Gallons
1	270	47	317	283	47	330
2	336	57	393	353	57	410
3	443	120	563	464	120	584
4	296	59	355	310	59	369
5	196	83	279	206	83	289
6	446	122	568	467	122	589
7	410	169	579	417	169	586
8	585	137	722	613	137	750
9	614	182	796	625	182	807
10	487	212	699	496	212	708
Total	4,083	1,188	5,271	4,234	1,188	5,422
	2010			2060		
1	306	47	353	335	47	382
2	381	57	438	417	57	474
3	501	120	621	549	120	669
4	335	59	394	367	59	426
5	222	83	305	244	83	327
6	505	122	627	553	122	675
7	430	169	599	447	169	616
8	662	137	799	725	137	862
9	644	182	826	669	182	851
10	512	212	724	531	212	743
Total	4,498	1,188	5,686	4,837	1,188	6,025

1/ Does not include irrigation

TABLE 39. PROJECTED RURAL WATER USE
DELAWARE RIVER BASIN

Sub-basin	1955					1975				
	Irrigation	Rural Residence	Livestock	Other	Total	Irrigation	Rural Residence	Livestock	Other	Total
	Million Gallons	Million Gallons	Million Gallons	Million Gallons	Million Gallons	Million Gallons	Million Gallons	Million Gallons	Million Gallons	Million Gallons
1	6	142	270	47	465	130	245	283	47	705
2	8	217	336	57	618	65	272	353	57	747
3	18	538	443	120	1,119	130	1,159	464	120	1,873
4	97	317	296	59	769	847	735	310	59	1,951
5	120	880	196	83	1,279	1,238	1,900	206	83	3,427
6	202	973	446	122	1,743	1,955	2,432	467	122	4,976
7	1,315	2,136	410	169	4,030	9,124	4,790	417	169	14,500
8	192	1,924	585	137	2,838	717	5,215	613	137	6,682
9	576	2,443	614	182	3,815	6,517	6,122	625	182	13,446
10	2,249	1,120	487	212	4,068	19,552	2,230	496	212	22,490
Total	4,783	10,690	4,083	1,188	20,744	40,275	25,100	4,234	1,188	70,797
	2010					2060				
1	130	245	306	47	728	130	245	335	47	757
2	65	272	381	57	775	65	272	417	57	811
3	130	1,159	501	120	1,910	130	1,159	549	120	1,958
4	847	735	335	59	1,976	847	735	367	59	2,008
5	1,238	1,900	222	83	3,443	1,238	1,900	244	83	3,465
6	1,955	2,432	505	122	5,014	1,955	2,432	553	122	5,062
7	9,450	4,790	430	169	14,839	10,101	4,790	447	169	15,507
8	717	5,215	662	137	6,731	717	5,215	725	137	6,794
9	6,843	6,122	644	182	13,791	8,146	6,122	669	182	15,119
10	19,877	2,230	512	212	22,831	21,180	2,230	531	212	24,153
Total	41,252	25,100	4,498	1,188	72,038	44,509	25,100	4,837	1,188	75,634

The question of cost and proximity to areas to be irrigated will need to be considered in order to determine how much of the potential storage can be economically utilized.

The net profit per irrigated acre for an average application of 8 inches of water is $42.06.[1/] On this basis, farmers could pay as much as 19.36 cents per 1,000 gallons and still break even. The full net value of water for irrigation purposes cannot be assessed against farmers in a form of water charges. If the farmers were expected to pay the full net value, then there would be no economic reason for their undertaking irrigation. The commercial rate in the Wilmington, Delaware, industrial area is 12 to 15 cents per 1,000 gallons. By using the lower commercial rate of 12 cents, the farmer could apply 8 inches of water and make a profit of about $10.00 per acre irrigated. This places the farmer in direct competition with industry in the use of water.

In the determination of economic feasibility, transmission, seepage, and evaporation losses will need to be considered. These losses cannot be evaluated until such time as specific plans are made for irrigation projects. Type of conduits and distance from source to area of use will have a major effect upon losses and costs. Water requirements for irrigation throughout the study period are the net amount to be applied to the land. In order to arrive at a gross deficiency of storage, allowances must be made for the various losses mentioned above.

Figure 15 shows the relationship between potentially irrigable land, 1955 to 2060, and the probable irrigated acres for the same period.

The upper curve, Potential Irrigable Acres, indicates a decline of approximately 60 percent in irrigable acreage between 1955 and 2010. This decline is a result of the transferring of agricultural land for urban-industrial expansion as discussed in Section 2-02 (Factors Influencing Extent of Irrigation in the Future) of this report. From 2010 to 2060, the loss of irrigable land declines approximately 22 percent. The greatest part of urban-industrial expansion will have taken place during the period between 1955 and 2010.

The lower curve, Probable Irrigated Acreage, represents the expected trend in the amount of irrigation from 1940 to 2060. The rising trend from 1940 to 1955 is expected to continue at the same rate through the period 1955 to 1975. This increase is the result of increased demands for vegetables and potatoes due to the expected urban-industrial expansion.

During 1975 to 2060, it is expected that irrigation will level off to a very moderate increase.

1/ Annually

The area between the two curves approximates the potential irrigable acreage in the Delaware River Basin. It will be noted that, in the year 2060, approximately 100,000 acres of irrigable land will be available for future expansion. It is recognized that much of the present irrigable lands will be usurped by urban and industrial expansion. However, as these lands are forfeited to this expansion, farm operators will move their farming enterprise to other available agricultural lands.

Areas Adjacent to the Delaware Basin

There does not appear to be a shortage of irrigation and rural water supplies in this area for the foreseeable future.

Because of the anticipated urbanization and industrial expansion within the Basin (see "Use and Management of Land and Cover Resources" appendix, section on "Agriculture in the Delaware Basin"), the demands for water will be greatly increased in the future. In order to satisfy this demand, it is expected that the total supply from sources within the Basin will need to be utilized. It is highly problematical that any significant amount of water will be available for diverting to the water-dependent areas outside the Basin for irrigation. Competitive uses and the comparatively high cost of delivering water from the Delaware to the water-dependent areas precludes any significant utilization of irrigation water from this source. The study made for this report did not take into account the returns to irrigation in the water-dependent areas from sources within the Delaware Basin or every possible competitive use in those areas.

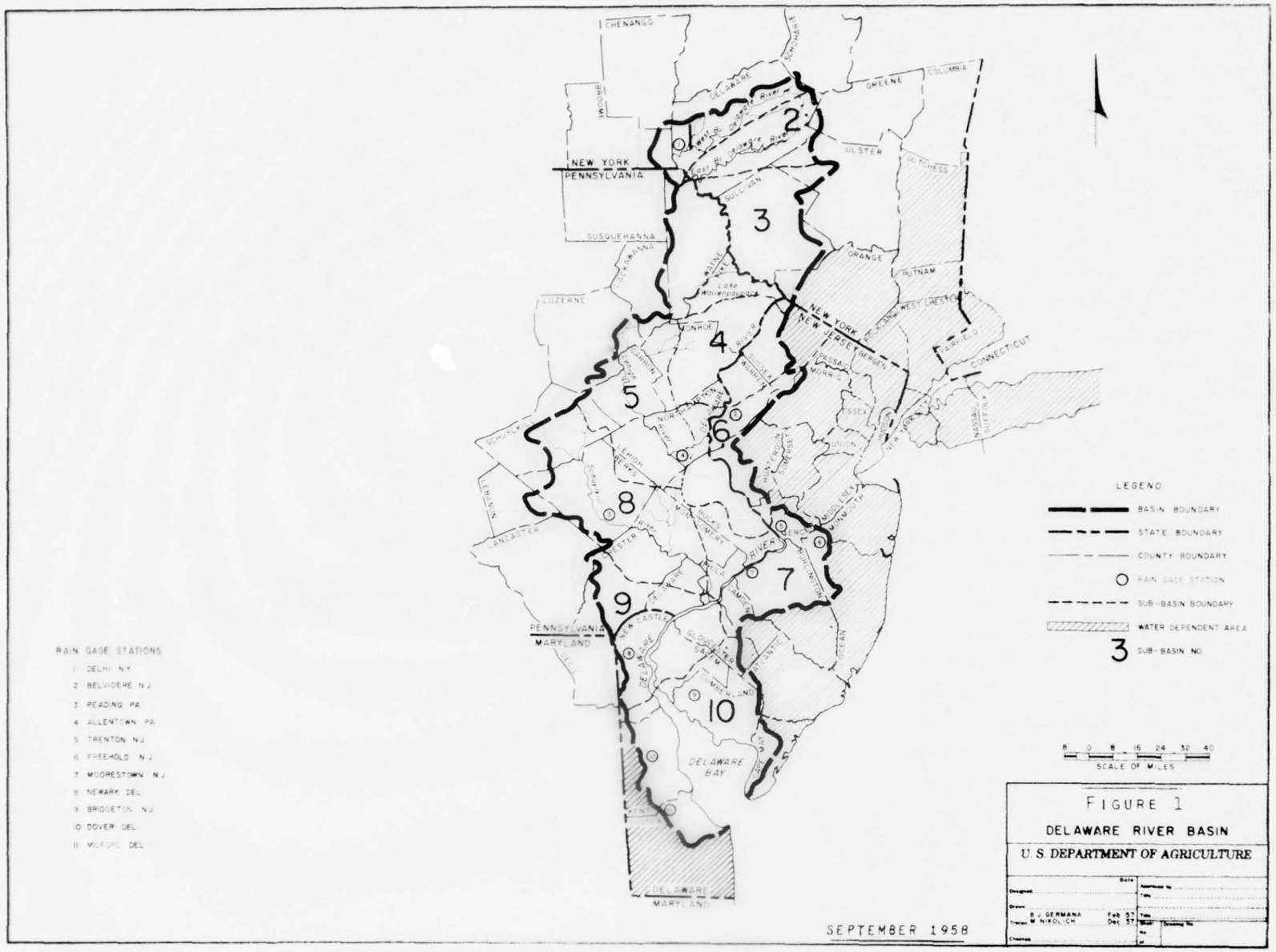


FIGURE 1

FIGURE 1

DELAWARE RIVER BASIN

U. S. DEPARTMENT OF AGRICULTURE

SEPTEMBER 1958

IRRIGATION IN DELAWARE RIVER BASIN

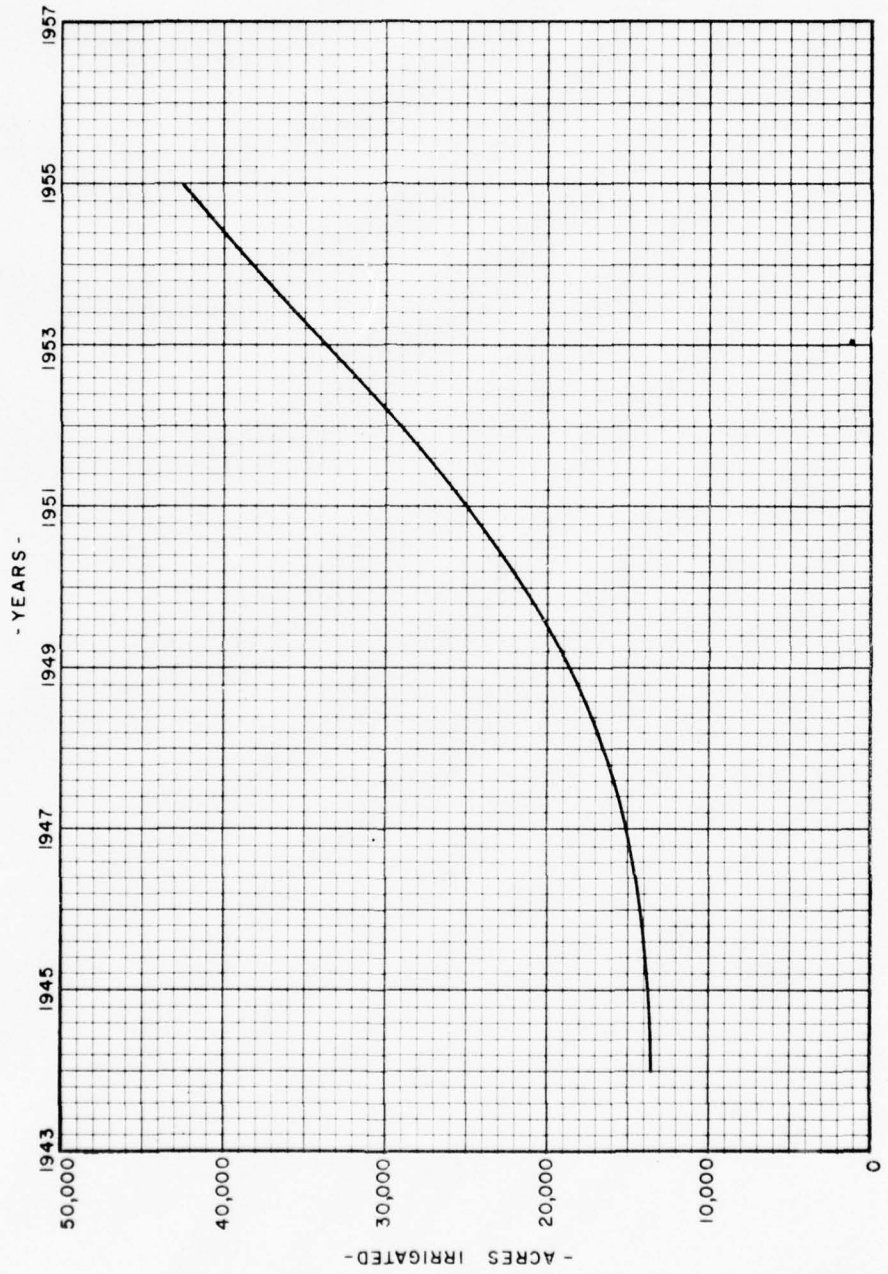


FIGURE 2

REFERENCE	U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE ENGINEERING & WATERSHED PLANNING UNIT UPPER DARBY, PENNSYLVANIA	DRAWING NO. SHEET 1 OF 1 DATE APRIL, 59

IRRIGATION WATER – APPLIED – VS – REQUIRED – 1955
DELAWARE RIVER BASIN

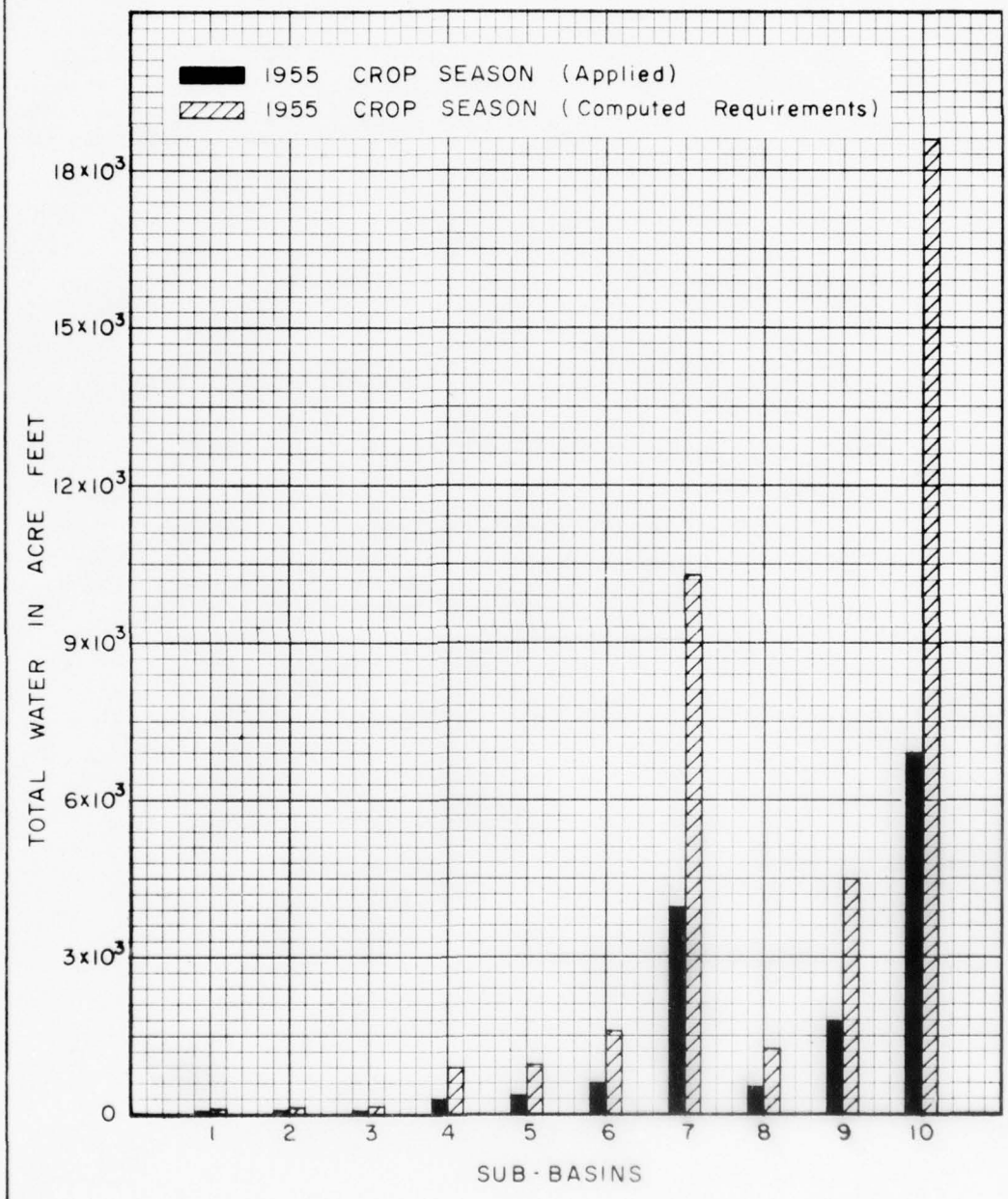
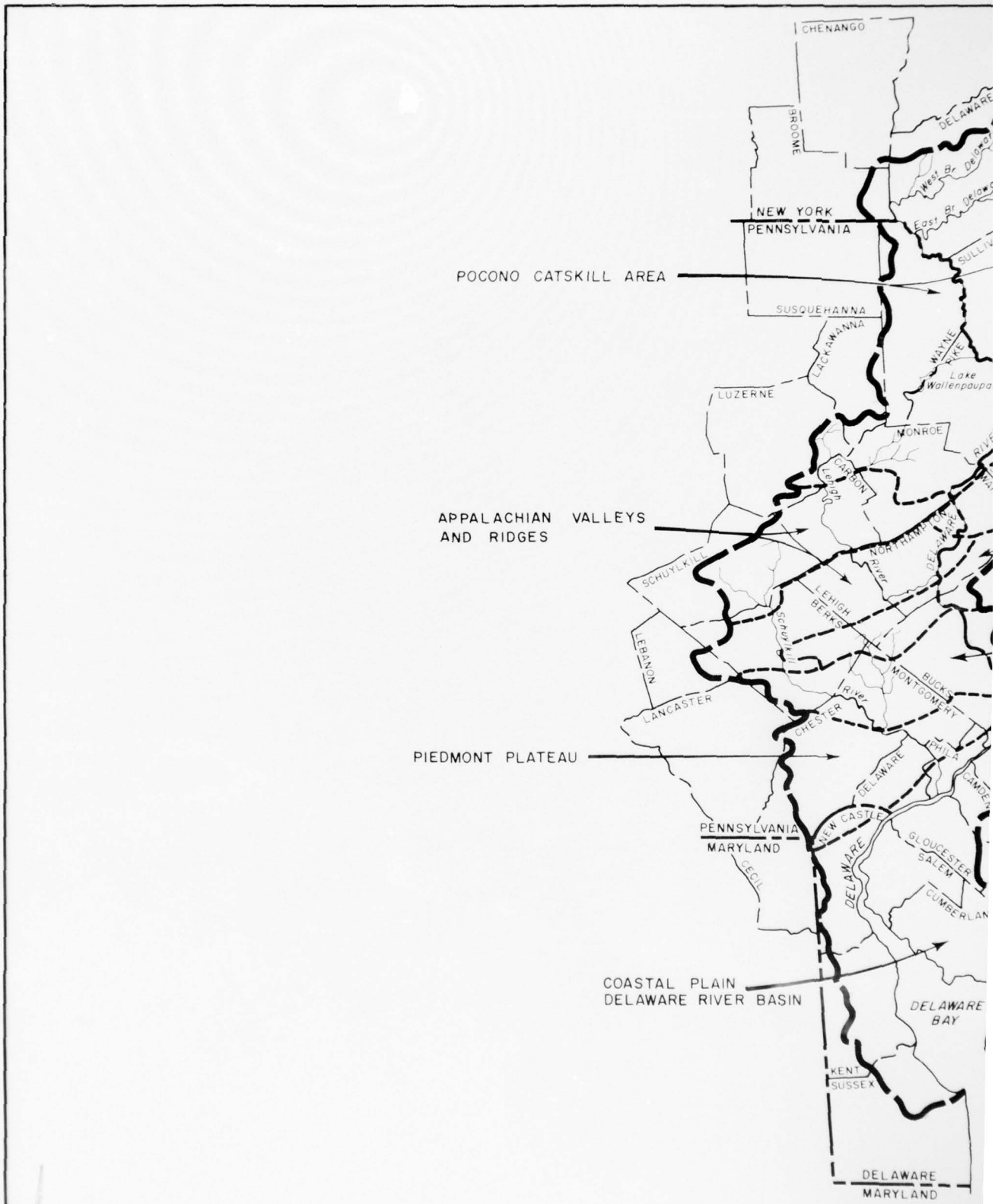
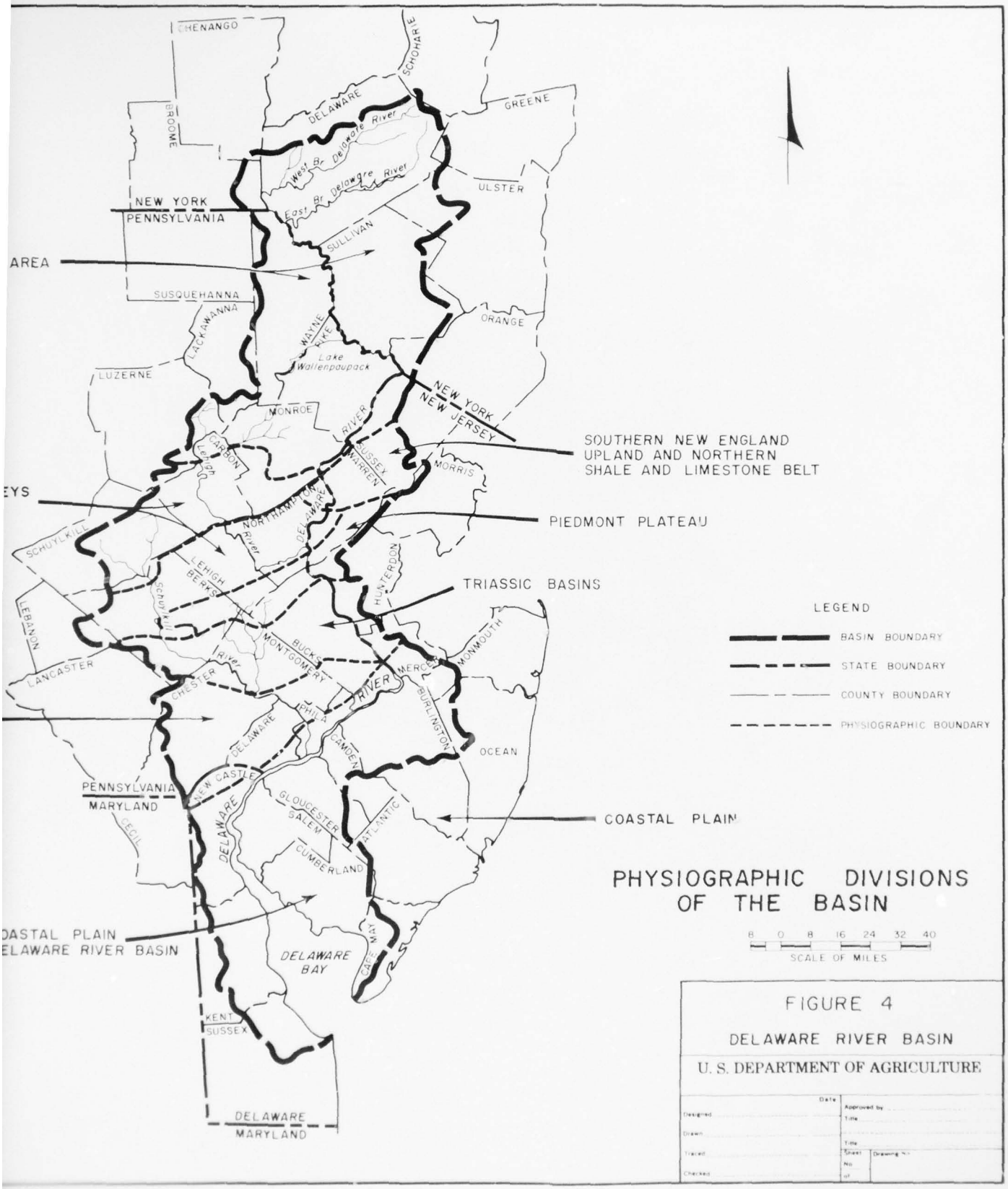


FIGURE 3

REFERENCE	U. S. DEPARTMENT OF AGRICULTURE	DRAWING NO.
		SHEET ____ OF ____
		DATE 8-58


CHENANGO
BROOME
DELAWARE
NEW YORK
PENNSYLVANIA
POCONO CATSKILL AREA
SUSQUEHANNA
LACKAWANNA
WAYNE
PIKE
LUZERNE
MONROE
CARBON
Lehigh
APPALACHIAN VALLEYS
AND RIDGES
NORTHAMPTON
SCHUYLKILL
LEHIGH
BERKS
LEBANON
LANCASTER
BUCKS
MONTGOMERY
CHESTER
PIEDMONT PLATEAU
PENNSYLVANIA
MARYLAND
CECIL
NEW CASTLE
GLOUCESTER
SALEM
COASTAL PLAIN
DELAWARE RIVER BASIN
DELAWARE
BAY
KENT
SUSSEX
DELAWARE
MARYLAND



PHYSIOGRAPHIC DIVISIONS OF THE BASIN

FIGURE 4

DELAWARE RIVER BASIN

U. S. DEPARTMENT OF AGRICULTURE

Designed	Date	Approved by	
Drawn		Title	
Traced		Title	
Checked		Sheet No. of	Drawing No.

DROUGHT DAY FREQUENCY
DELAWARE RIVER BASIN

SEASONAL

SUB-BASINS 1, 2, 3

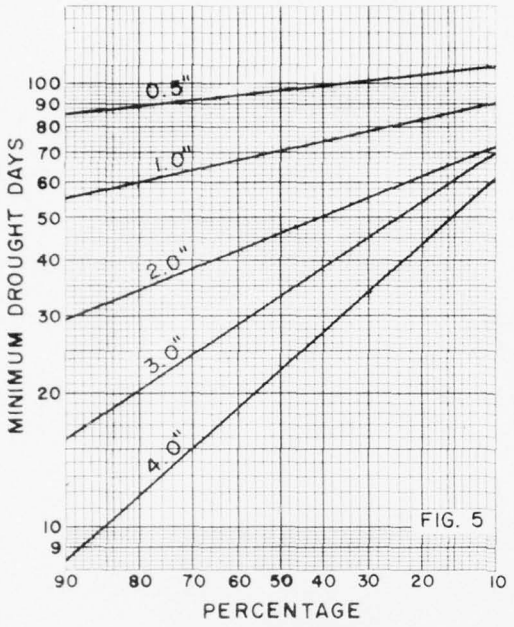


FIG. 5

SUB-BASIN 4

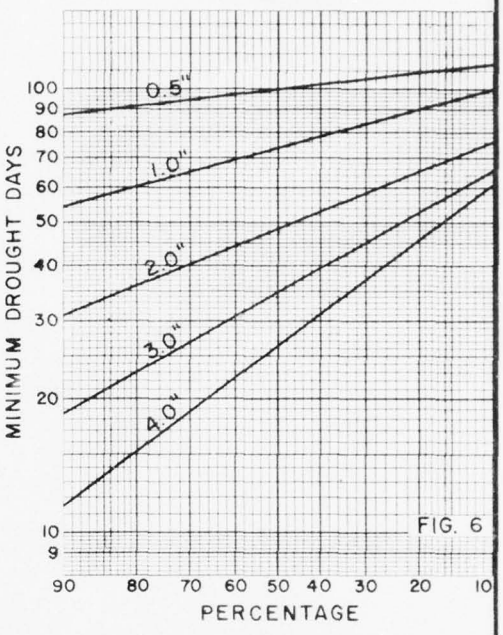


FIG. 6

SUB-BASIN 5

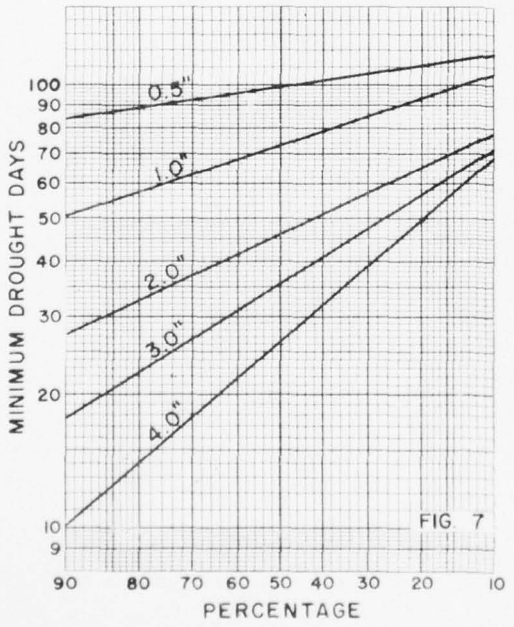


FIG. 7

SUB-BASIN 6

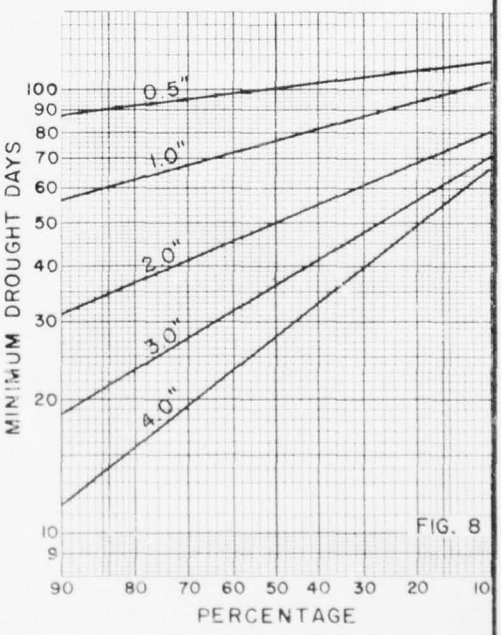


FIG. 8

REFERENCE:	U.S. DEPARTMENT OF AGRICULTURE	DRAWING NO. SHEET ____ OF ____ DATE SEPT. 1958

DROUGHT DAY FREQUENCY
DELAWARE RIVER BASIN

SEASONAL

SUB - BASIN 7

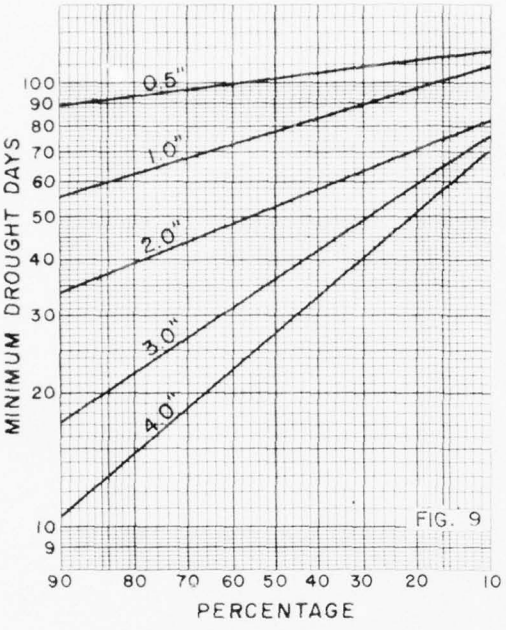


FIG. 9

SUB - BASIN 8

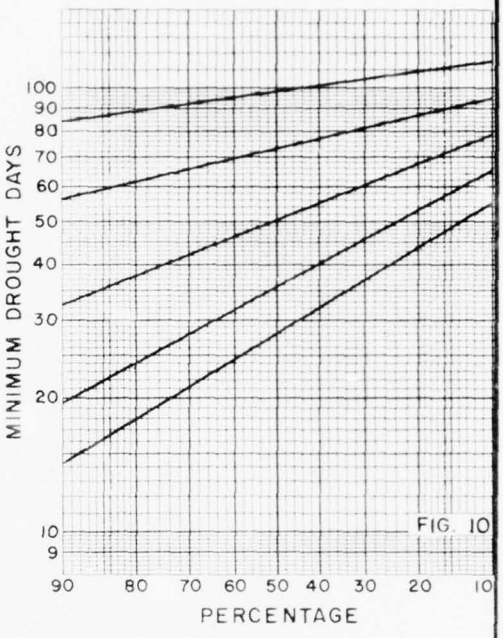


FIG. 10

SUB - BASIN 9

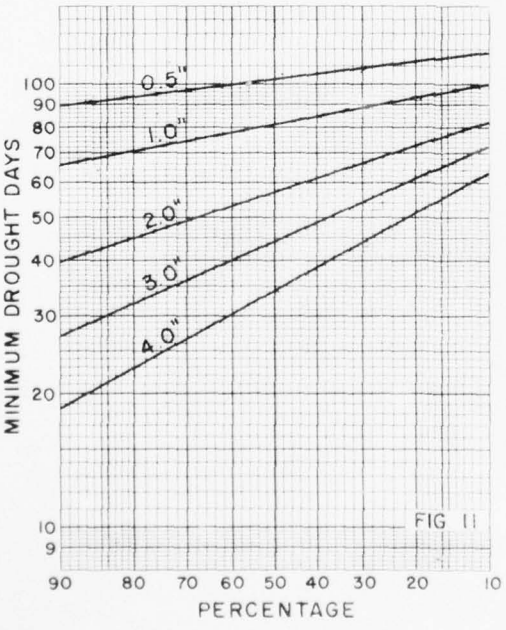


FIG 11

SUB - BASIN 10

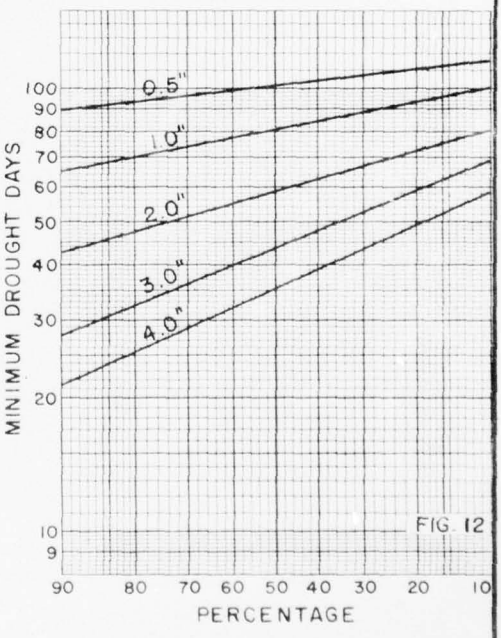


FIG 12

REFERENCE:	U.S. DEPARTMENT OF AGRICULTURE	DRAWING NO.
		SHEET ____ OF ____
		DATE SEPT. 1958

COMMERCIAL VEGETABLE PRODUCTION AND ACRES IN NEW JERSEY 1943 - 1955

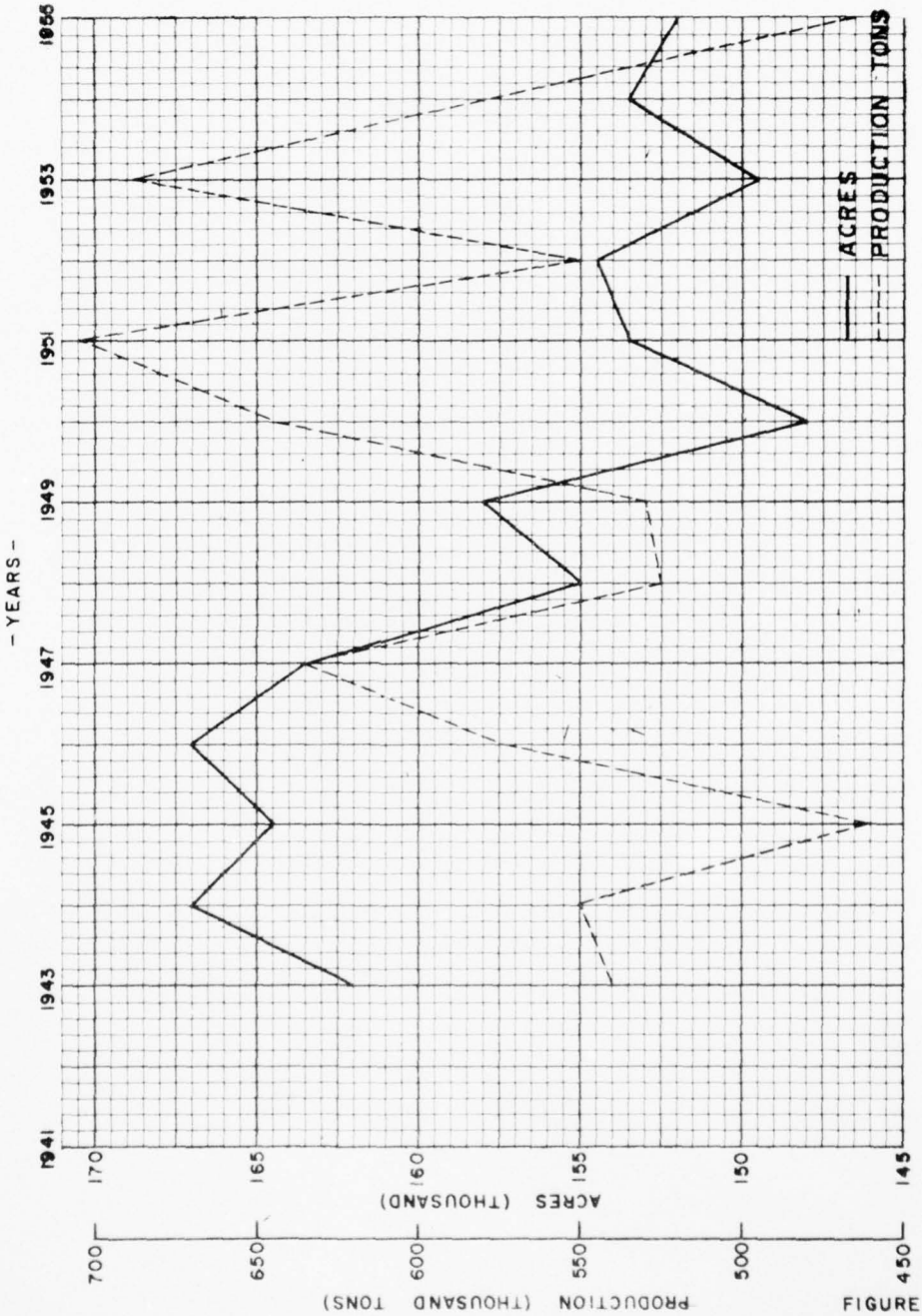


FIGURE 13

REFERENCE	U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE ENGINEERING & WATERSHED PLANNING UNIT UPPER DARBY, PENNSYLVANIA	DRAWING NO. SHEET 1 OF 1 DATE APRIL 59

POTENTIAL IRRIGABLE ACREAGE VS PROBABLE IRRIGATED ACREAGE – DELAWARE RIVER BASIN

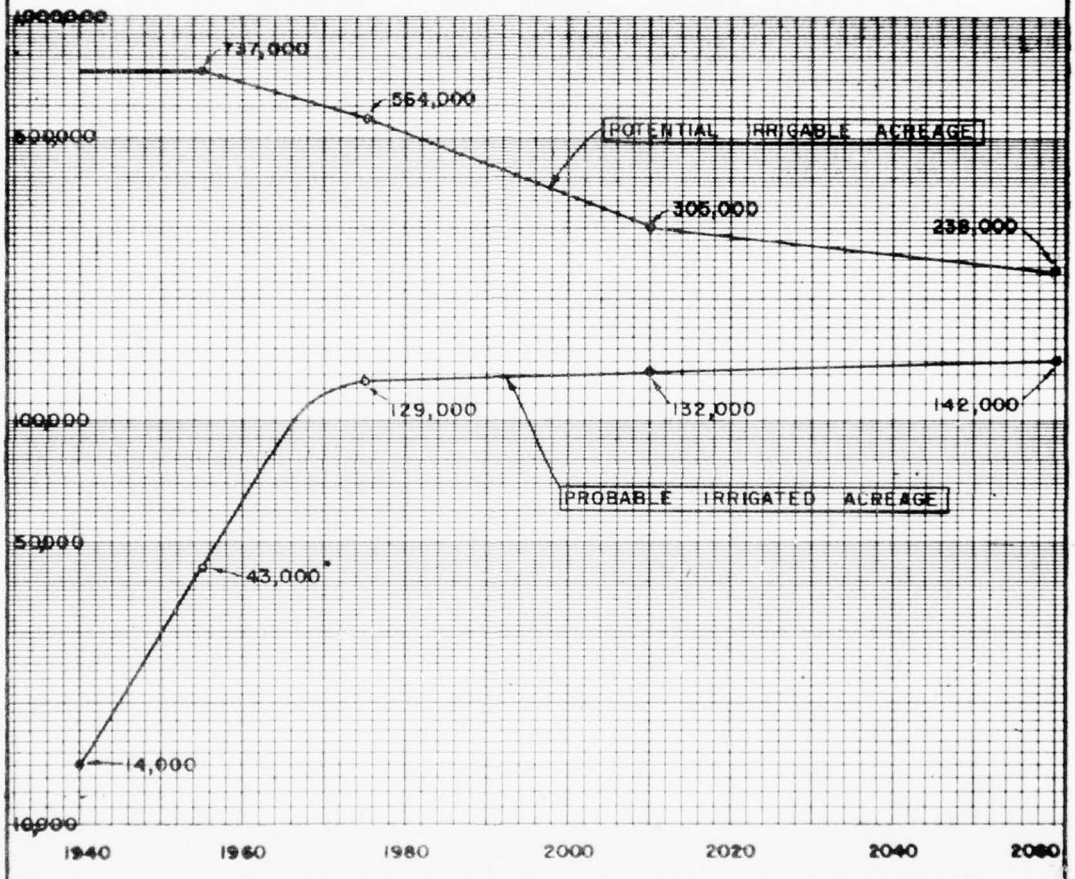
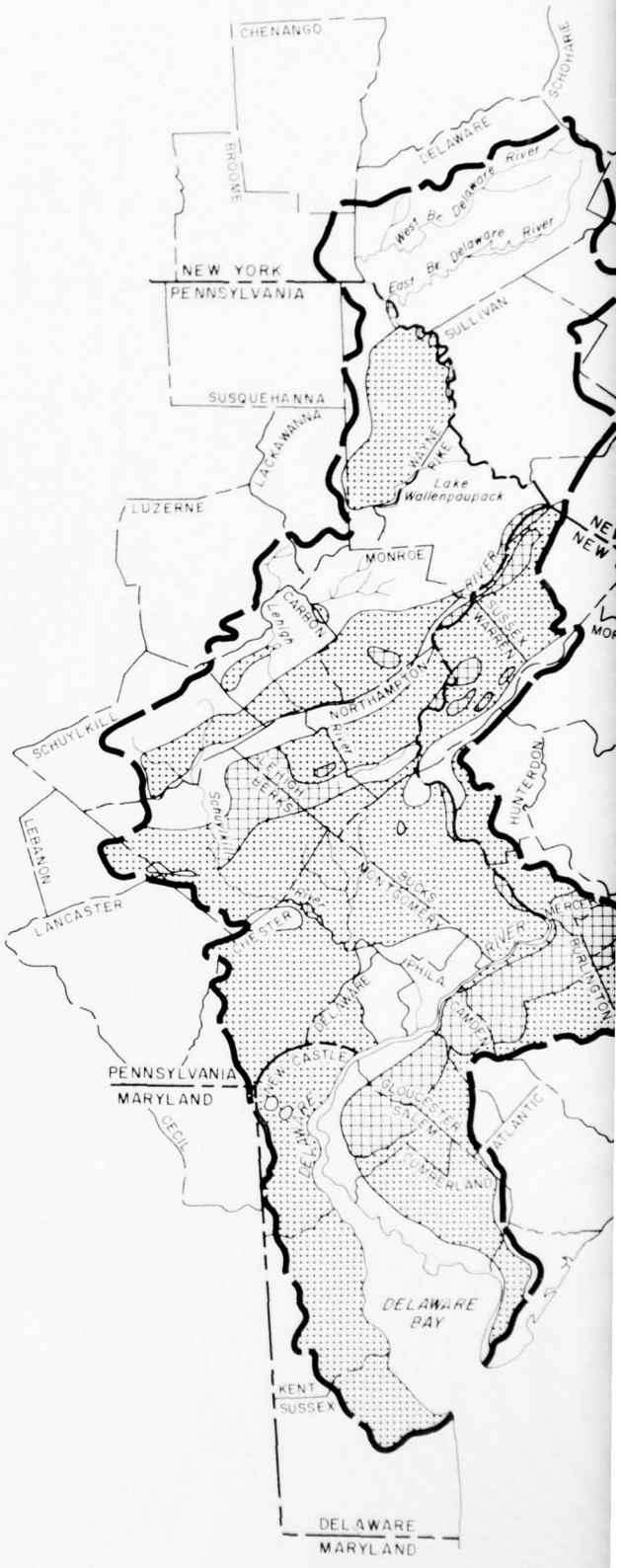
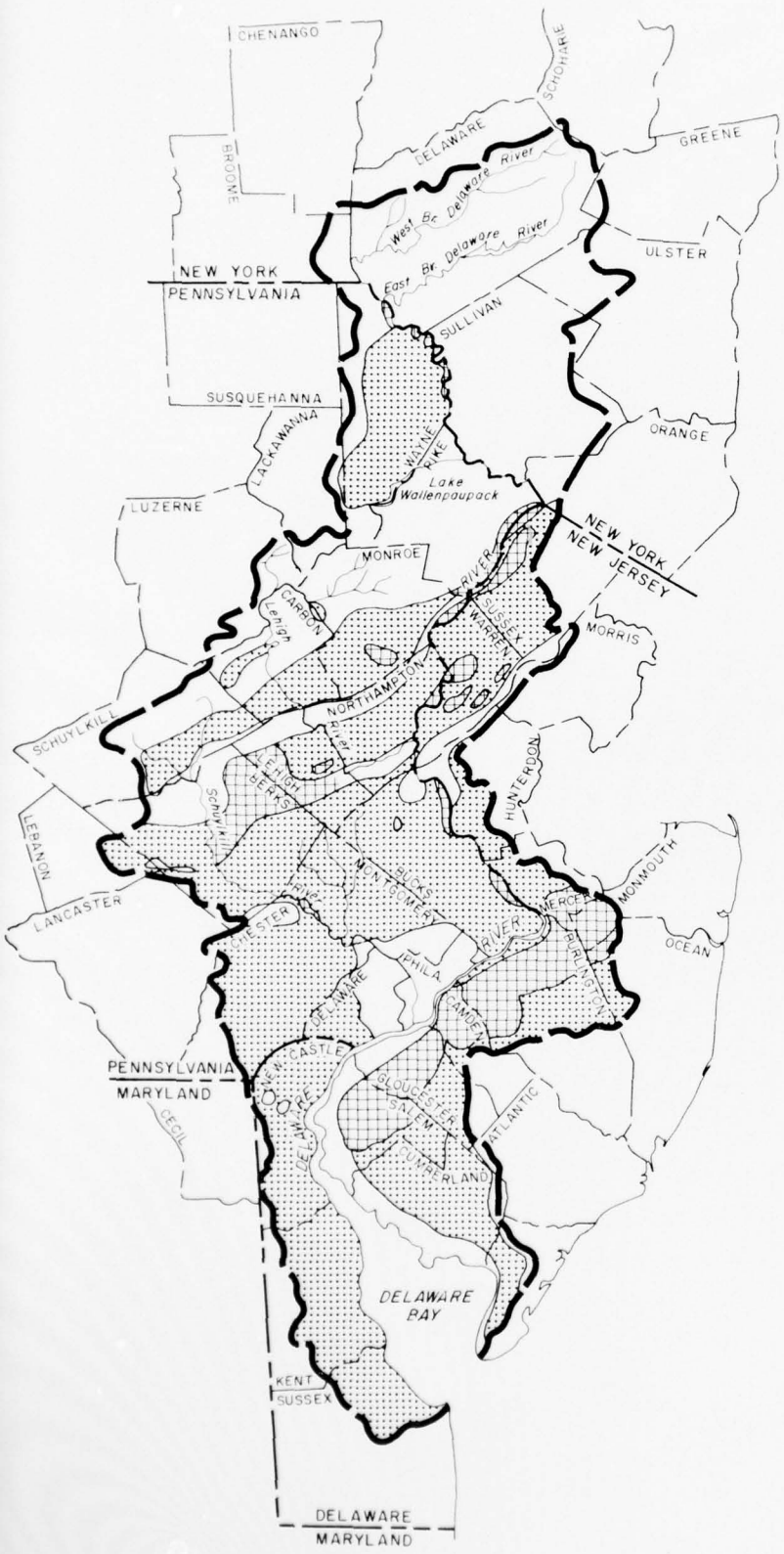


FIGURE 14

REFERENCE	U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE ENGINEERING & WATERSHED PLANNING UNIT UPPER DARBY, PENNSYLVANIA	DRAWING NO. SHEET 1 OF 1 DATE APRIL 59


CHENANGO
BROOME
DELAWARE
SCHOHARIE
West Br Delaware River
East Br Delaware River
NEW YORK
PENNSYLVANIA
SULLIVAN
SUSQUEHANNA
WAYNE
PIKE
LACKAWANNA
Lake Wallenpaupack
LUZERNE
MONROE
CARBON
NORTHAMPTON
SCHUYLKILL
BERKS
LEBANON
LANCASTER
HUNTERDON
PHILA
DELAWARE
PENNSYLVANIA
MARYLAND
CECIL
NEW CASTLE
ATLANTIC
DELAWARE BAY
KENT
SUSSEX
DELAWARE
MARYLAND



LEGEND

- BASIN BOUNDARY
- STATE BOUNDARY
- COUNTY BOUNDARY
- SCATTERED AREAS
- CONCENTRATED AREAS

FIGURE 15

8 0 8 16 24 32 40
SCALE OF MILES

LOCATION OF POTENTIALLY IRRIGABLE LAND
DELAWARE RIVER BASIN

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

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Checked		Sheet No. of	Drawing No.

Form SCS-313 (November 1955)

REPORT ON THE COMPREHENSIVE SURVEY OF THE WATER RESOURCES OF THE DELAWARE RIVER BASIN

APPENDIX H

FLUVIAL SEDIMENT

PREPARED BY

J. W. WARK
U. S. GEOLOGICAL SURVEY

AND

G. ROBERT HALL
SOIL CONSERVATION SERVICE

SEPTEMBER 1959

FOR

U. S. ARMY ENGINEER DISTRICT, PHILADELPHIA
CORPS OF ENGINEERS
PHILADELPHIA, PA.

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Sediment concentration	12
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Trends in sediment yield	14
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8 Generalized curves of reservoir sedimentation in the Delaware River basin .....
9 Generalized curve of reservoir sedimentation in physical subdivision 1 .....
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INTRODUCTION

The Corps of Engineers, United States Army, has been directed to prepare for transmittal to the Congress, the best plan for the conservation, control, and use of the water resources of the Delaware River basin. The Geological Survey of the Department of the Interior and the Soil Conservation Service of the Department of Agriculture were requested by the Corps of Engineers to participate in developing this plan. As part of its contribution, the Geological Survey was asked to provide data on the fluvial sediment processes and regimen of streams in the basin. The Soil Conservation Service was requested to determine the effect of land treatment and structural measures for flood prevention and watershed protection on streamflow and on sedimentation. This report summarizes the sedimentation data assembled by both agencies and presents a preliminary appraisal of sediment conditions in the Delaware River basin.

Two methods of approach were used to study the sediment characteristics of the basin. The Geological Survey, by reason of its continuing efforts in the field of water-resources investigations, has collected fluvial sediment data in the basin since 1947. These data, supplemented by measurements at selected locations made during storm periods, were studied to determine average suspended-sediment loads, sediment concentrations and sediment particle-size distribution. Locations at which data have been collected are shown in figure 1, and the periods of record are shown in figure 2. The Soil Conservation Service has available data on soils, land uses, and erosion conditions in the basin. Also, to carry out responsibilities relating to flood prevention and watershed protection, data have been developed on soil erosion, sediment delivery rates and reservoir sedimentation. These data provide information from which approximate sediment yields at any point in the basin can be computed.

The investigations made by the Soil Conservation Service were made under the supervision of Fred H. Larson, Head, Engineering and Watershed Planning Unit, Upper Darby, Pa. Those made by the U. S. Geological Survey were under the supervision of Norman H. Beamer, District Chemist for Delaware, New Jersey, and Pennsylvania. The Corps of Engineers provided financial assistance to both agencies for these investigations.

Previous investigations of sediment movement in the Delaware River basin have been extremely limited. A review of the adequacy of basin sedimentation data in 1950 indicated that available data in the basin represented less than 40 percent of the estimated total required at that time. (Federal Inter-agency River Basin Committee, 1950).

A comprehensive study of the effects of the Schuylkill River Restoration Project on sediment loads was started in 1947 by the Commonwealth of Pennsylvania and the U. S. Geological Survey. The results of this program to reduce the amount of culm being discharged into the Schuylkill River and its tributaries have been reported on by White and Lindholm (1950). The State of Delaware and the U. S. Geological Survey have collected suspended-sediment data on Brandywine Creek at Wilmington, Del., since 1947. These measurements are being made to determine long-term trends in sediment yield as a result of soil-conservation activities. An analysis of the first 9 years of data has been made by Guy (1957). Sediment data on the Delaware River at Trenton, N. J., have been collected continuously since 1949 by the Geological Survey as part of a nationwide program to appraise water quality. Data for the period 1949 to 1955 are given in U. S. Geological Survey Water-Supply Papers 1162, 1186, 1197, 1250, 1290, 1350, and 1400. Unpublished data are available for inspection in the office of the U. S. Geological Survey, Harrisburg, Pa.

The U. S. Department of Agriculture has prepared a "Program for Runoff and Water-flow retention and Soil-erosion Prevention" for the Delaware River basin (1950). The unpublished appendix of this report contains an inventory of the soils, the land use and erosion conditions, by physical subdivision, of the Delaware River basin.

A report "Community Watershed Soil and Water Conservation Work Plan for Brandywine Creek" was prepared by the Soil Conservation Service in 1952. This report presents in detail, the soil, erosion, and land use conditions in that watershed. The report also contains a summary of sedimentation data on Rock Run and Icedale Reservoirs, the only data of this type available in the Delaware River basin.

Watershed work plans have been prepared for six tributaries of the Delaware River; the Pequest River watershed (158 sq mi), Paulins Kill, N. J., (177 sq mi), Lackawaxen River tributaries, Pa., (42 sq mi), Green-Dreher area in the Wallenpaupack Creek basin, Pa., (75 sq mi), Little Schuylkill River basin, Pa., (137 sq mi), and Brandywine Creek, Pa. and Del., (329 sq mi). These plans were prepared by local organizations, cooperating with the Soil Conservation Service. Data covering soils, erosion, land use, and hydrologic conditions in these watersheds are available to interested persons, at the office of the Soil Conservation Service, Upper Darby, Pa.

SUMMARY

Sediment loads vary, both in time and place, and most of the sediment in the Delaware River basin is transported by a relatively few intense storms. Annual suspended-sediment loads of the Delaware River at Trenton, N. J., based on 8 years of record, range from 59 tons per square mile to 342 tons per square mile. Estimated average annual load of Bush Kill at Shoemakers, Pa., is 33 tons per square mile, and that for Neshaminy Creek near Langhorne, Pa. is 270 tons per square mile.

Suspended-sediment concentrations in streams in the basin are low much of the time. For example, the sediment concentration of Brandywine Creek at Wilmington, Del., was less than 25 ppm for 81 percent of the time during the period 1947-55.

Size analyses of syspended-sediment samples show that the sediments are mostly silt (0.004-.062mm). Visual observations of streambed material indicate that in the upper portion of the basin the particles are mostly coarse gravel and boulders; whereas in the lower part of the basin the material is mostly sand, silt, and clay.

There is no apparent trend in the sediment yield of the Delaware River at Trenton, N. J. On the other hand, the sediment yield of the Schuylkill River and Brandywine Creek show a significant decreasing trend during the periods of record.

Sediment yield of tributaries of the Delaware River is estimated from data on land use, estimated sheet erosion in the basin, and a sediment delivery-rate curve. Estimated annual yields range from 33 tons per square mile for the Mongaup River to 265 tons per square mile for Chester Creek.

Sheet erosion is believed to be the predominant source of sediment in the lower part of the basin; in the steep upland areas channel erosion and bank scour are considered to be the principal sediment sources.

Sediment accumulation during a 50-year period in four proposed reservoirs should be relatively insignificant.

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SEDIMENT STUDIES BY THE U. S. GEOLOGICAL SURVEY

By J. W. Wark

SEDIMENT LOAD

Sediment transported by streams can be classified as suspended load and bed load. Generally the suspended load consists of the smaller particles that are in continuous suspension due to the streams' turbulence. Bed load, on the other hand, consists mostly of larger particles that are moved by sliding, rolling, or skipping along the bed. In the Delaware River basin most of the sediment is believed to be transported as suspended load. Although no satisfactory method exists to measure the bed load, estimates by experienced observers indicate that perhaps only 10 percent of the total load is moved as bed load.

The quantity of sediment transported by a stream depends upon the availability of the material as well as the stream's transporting capability. The rate at which sediment is transported varies from stream to stream and with time. In the Delaware River basin most of the sediment is transported during a relatively few intense storms. During the water years 1950-57 the average annual suspended load of the Delaware River at Trenton, N. J., was 148 tons per square mile and ranged from 59 tons per square mile in 1957 to 342 tons per square mile in 1955 (table 1). The high load in 1955 was the result of the heavy rains and floods accompanying Hurricane Diane. During the 2-day period, August 19-20, the Delaware River at Trenton carried about 1.9 million tons of sediment, or approximately 26 percent of the total suspended load for the 8-year period. The frequency of daily suspended-sediment load is shown by a load-duration curve (fig. 3). The daily load at Trenton equaled or exceeded 180 tons about 50 percent of the time and equaled or exceeded 9,000 tons about 5 percent of the time during the period of record.

The combined average annual suspended load during the period 1954-57 for the Delaware River at Trenton, N. J., the Schuylkill River at Manayunk, Philadelphia, Pa., and Brandywine Creek at Wilmington, Del., was 1.41 million tons or 158 tons per square mile of drainage area. If the same load applies to the remainder of the basin, a total of approximately two million tons left the basin annually.

During the 1957 and 1958 water years existing data collection programs were supplemented by collecting suspended-sediment samples at 11 additional locations in the basin. Samples were collected during periods of high runoff at U. S. Geological Survey gaging stations having long-term records of streamflow. Data collected at these stations are given in table 11. Suspended-load measurements were correlated with

Table 1.--Annual suspended-sediment load in tons per square mile

Reference no.	Station	Water year									
		1948	1949	1950	1951	1952	1953	1954	1955	1956	1957[a]
9	Lehigh River at Walnutport, Pa.	-	249	113	576	292	-	-	-	-	-
12	Delaware River at Trenton, N. J.	-	-	64.4	217	161	163	63.5	342	113	59
14	Schuylkill River at Port Carbon, Pa.	-	-	310	-	-	-	-	-	-	-
15	Schuylkill River at Landingville, Pa.	3,870	1,070	568	976	860	-	-	-	-	-
16	Schuylkill River at Auburn, Pa.	2,760	1,060	510	-	-	-	-	-	-	-
17	Little Schuylkill River at South Tamaqua, Pa.	-	-	-	1,590	1,970	-	-	-	-	-
18	Little Schuylkill River at Drehersville, Pa.	2,760	743	373	-	-	-	-	-	-	-
19	Schuylkill River at Berne, Pa.	3,220	1,150	135	511	268	244	46.4	228	46.1	63.7
20	Schuylkill River at Pottstown, Pa.	-	498	198	715	-	-	-	-	-	-
21	Perkiomen Creek at Graterford, Pa.	-	99.2	147	211	283	-	-	-	-	-
22	Schuylkill River at Manayunk, Philadelphia, Pa.	731	730	365	1,200	800	565	82.2	523	131	109
23	Brandywine Creek at Wilmington, Del.	258	74.2	92.3	214	273	154	51.4	227	102	111

a/ 1957 data provisional and subject to revision

concurrent water discharge to give an average relationship of sediment load to water discharge. Figure 4 shows the curve drawn for Neshaminy Creek near Langhorne, Pa. Similar curves and tables of flow duration for each location provide the necessary information to compute an average annual suspended-sediment yield. An analysis of the accuracy and limitations of the procedure used has been made by Miller (1951). The method of computation consists of determining, from the load-discharge curve, the sediment load for water discharges that correspond to the given increments of discharge in the flow-duration table. These increments of sediment load are then multiplied by the corresponding percent of discharge occurrence and totaled to give the average daily sediment load. By multiplying this value by the number of days in a year, the average annual sediment load is obtained. Table 2 shows the computation of sediment load for Neshaminy Creek near Langhorne, Pa. The sediment load estimated by this method includes only the suspended load. Bed load at each station was assumed to equal 10 percent of the suspended load. This amount is added to the computed suspended load to give an estimate of the average annual total sediment load. These estimates for the streams studied are given in table 3.

This method of estimating sediment yield is based on the following assumptions:

1. The relationship of instantaneous values of sediment load to water discharge is similar to the relationship for daily values.
2. The load-discharge relationship existing during the period of field measurements represents the long-term relationship.
3. Water-discharge records, as summarized in duration tables, represent the long-term flow regimen of the stream.

Changes in any of the more important factors relating to sediment yield, such as cover and land use, would probably alter the average relationship of sediment load to water discharge. Also, any extensive regulation of streamflow by the construction of storage facilities would affect this relationship.

Table 2.--Computation of average annual sediment load of Neshaminy Creek near Langhorne, Pa.

1 Percent limits	2 Percent interval	3 Percent mid-ordinate	4 Stream discharge (cfs)	5 Sediment load (tons per day)	6 Column 2 times column 5 (tons/day)
0.00-0.75	0.75	0.375	5,000	10,000	75.0
0.75-1.5	0.75	1.125	2,780	2,900	21.8
1.5 -3.5	2.0	2.5	1,600	930	18.6
3.5 -7.5	4.0	5.5	900	285	11.4
7.5 -15	7.5	11.25	530	92	6.9
15 -25	10	20	328	32	3.2
25 -35	10	30	220	15	1.5
35 -45	10	40	158	7	0.7
45 -55	10	50	115	3	0.3
55 -65	10	60	85	1.7	0.2
65 -75	10	70	60	0.8	0.1
75 -85	10	80	41	0.3	
85 -95	10	90	23		
95-100	5	97.5	14		
				Total	139.7

Average annual suspended load = 365 x 139.7 = 50,600 tons per year
Add 10 percent for bed load = 5,060 tons per year
Total = 55,660 tons per year

Average annual load = $\frac{55,660 \text{ tons}}{210 \text{ sq mi}}$ = 270 tons per sq mi

Table 3.--Computed annual sediment load of streams in the Delaware River basin

Reference no.	Station	Drainage area (sq mi)	Annual sediment load (tons per sq mi)
1	East Branch Delaware River at Fishs Eddy, N. Y.	783	59
2	West Branch Delaware River at Hale Eddy, N. Y.	593	55
3	Delaware River near Barryville, N. Y.	2,023	65
4	Lackawaxen River at Hawley, Pa.	290	115
5	Delaware River at Port Jervis, N. Y.	3,076	a/110
6	Neversink River at Godeffroy, N. Y.	302	49
7	Bush Kill at Shoemakers, Pa.	117	33
8	Delaware River above Pequest River at Belvidere, N. J.	4,377	123
9	Lehigh River at Walnutport, Pa.	889	131
10	Musconetcong River near Bloomsbury, N. J.	143	52
11	Tohickon Creek near Pipersville, Pa.	97.4	76
12	Delaware River at Trenton, N. J.	6,780	b/163
13	Neshaminy Creek near Langhorne, Pa.	210	270
19	Schuylkill River at Berne, Pa.	355	c/106
21	Perkiomen Creek at Graterford, Pa.	279	140
22	Schuylkill River at Manayunk, Philadelphia, Pa.	1,893	c/232
23	Brandywine Creek at Wilmington, Del.	314	c/135

a/ Estimated from daily station record and by routing loads from upstream station.
b/ Based on 1950-57 measured suspended load with allowance for bed load.
c/ Based on 1954-57 measured suspended load with allowance for bed load.

SEDIMENT CONCENTRATION

The suspended-sediment concentration in streams in the Delaware River basin is low much of the time. For example, during the water years 1950-57 the sediment concentration of the Delaware River at Trenton, N. J., was equal to or less than 5 ppm (parts per million) 30 percent of the time and equal to or less than 25 ppm 81 percent of the time. Also, the sediment concentration of Brandywine Creek at Wilmington, Del., was less than 5 ppm 24 percent of the time and less than 25 ppm 77 percent of the time during the period September 1949 to September 1955.

The meager amount of data on other streams in the basin precludes any accurate estimate of range in sediment concentration. Measurements made during this investigation were necessarily made during high flows in order to determine sediment loads. Consequently, concentrations measured are not representative of those that occur much of the time. Quantitative estimates of sediment concentration of these streams can be made using sediment load-water discharge curves and water discharge duration tables. To arrive at an approximate sediment concentration that is exceeded only 10 percent of the time, the suspended-sediment load is obtained from the load-discharge curve with that water discharge exceeded 10 percent of the time. For Neshaminy Creek near Langhorne, Pa., this value is 573 cubic feet per second. From the curve (fig. 4) the corresponding sediment load is 105 tons per day. The sediment concentration necessary to give this load is 68 ppm. Sediment concentrations exceeded only 10 percent of the time, as estimated by this method for streams in the Delaware River basin are given in table 4.

Table 4.--Estimated suspended-sediment concentrations expected to be exceeded 10 percent of the time

Reference no.	Station	Sediment concentration exceeded only 10 percent of time (ppm)
1	East Branch Delaware River at Fishs Eddy, N. Y.	17
2	West Branch Delaware River at Hale Eddy, N. Y.	20
3	Delaware River near Barryville, N. Y.	23
4	Lackawaxen River at Hawley, Pa.	26
6	Neversink River at Godeffroy, N. Y.	23
7	Bush Kill at Shoemakers, Pa.	12
8	Delaware River above Pequest River at Belvidere, N. J.	46
9	Lehigh River at Walnutport, Pa.	42
10	Musconetcong River near Bloomsbury, N. J.	35
11	Tohickon Creek near Pipersville, Pa.	135
12	Delaware River at Trenton, N. J.	a/47
13	Neshaminy Creek near Langhorne, Pa.	68
21	Perkiomen Creek at Graterford, Pa.	37
22	Schuylkill River at Manayunk, Philadelphia, Pa.	b/50
23	Brandywine Creek at Wilmington, Del.	c/62

a/, b/, and c/ From concentration frequency curve for period 1950-57, 1953-57, and 1947-55 respectively.

NATURE AND SIZE COMPOSITION OF SEDIMENT

Size analyses of suspended sediments have been made by the Geological Survey as an integral part of fluvial-sediment investigations. Figure 5 shows the size composition of suspended-sediment samples collected in the Delaware River basin. The grouping of the plotted points in the lower right portion of the triangle indicates that most of the samples are composed largely of silt (0.004 to 0.062 mm). Size composition at a station varies appreciably as can be seen by the plot of 15 analyses of suspended-sediment samples of the Delaware River at Trenton, N. J. (fig. 6). Grouping of these analyses according to water discharge indicates that a greater percentage of sand (0.062 to 2.00 mm) is transported during high flows.

The size composition of streambed material varies from predominantly coarse particles in the headwaters of the basin to mostly fine material in the lower part of the basin. Visual observations of bed material in the upper part of the basin indicate the particles are mostly coarse gravel, cobbles, and boulders. In the lower part of the basin, the transition from fine to coarse materials is thought to be rather smooth, based on limited sample analysis and observation. An estimate of the nature of the sediment deposited in the Delaware Bay has been made by Schultz and Simmons (1957), who show that approximately 95 percent of the deposited sediment passes a 200 mesh sieve (0.074 mm) and is predominantly clay and silt.

Sediment in the Delaware River basin is derived from natural sources and wastes from industry. One notable type of industrial waste is the culm derived from coal mining activities in the Schuylkill River basin. Analysis of 269 suspended-sediment samples collected in the Schuylkill River basin during the period 1947-49 shows that about 53 percent of the sediment was combustible material. Since that time, the operation of desilting basins and the control of mine wastes have materially reduced the amount of culm found in suspended-sediment samples.

TRENDS IN SEDIMENT YIELD

The detection of trends in sediment yield is a difficult task in view of the many controls that influence the yield. J. K. Culbertson[1/] of the U. S. Geological Survey has made an analysis of sediment-load records of the Delaware River at Trenton, N. J., Schuylkill River at Manayunk, Philadelphia, and the Lehigh River at Walnutport, Pa. Average relationships of monthly sediment load to water discharge were

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1/ Written communication, June 1957

developed. Departures from the average were arranged in chronological order and analyzed for trend by the rank correlation method. Results of this study showed no significant trend in load-discharge relationship of the Delaware River at Trenton, N. J. This is to be expected inasmuch as no major sediment-control structures were constructed above this station during the period of record. Analysis of the Schuylkill River and the Lehigh River records showed a significant trend toward a decreasing sediment yield for a given runoff. Sediment loads in the Schuylkill River have been reduced by the construction of desilting basins and the regulations of waste disposal procedures of the coal industry. For example, the average sediment load of the Schuylkill River at Berne, Pa., (table 1) for the first 5 years of record (1948-52) was 1,060 tons per square mile, and for the last 5 years (1953-57) it was only 126 tons per square mile. An analysis by Guy (1957) of the trend in suspended-sediment load of Brandywine Creek at Wilmington, Del., showed an approximate 38-percent decrease in sediment yield for the period 1952 to 1955 from that for the period 1947 to 1951.

SEDIMENT STUDIES BY THE SOIL CONSERVATION SERVICE

By G. R. Hall

SEDIMENT YIELD

Sediment yield may be defined as the total sediment outflow from a watershed. It includes both bed materials and suspended materials. Sediment yield is a function of the amount of erosion in the watershed and the efficiency of the stream systems in transporting the eroded materials.

Erosion and sediment yield are not synonymous because of progressive deposition of eroded materials enroute from point of origin to the point under consideration in the watershed. Sediment yield correlates with erosion to the extent that a decrease in the supply (erosion) results in a similar decrease in sediment yield (Hudson and others, 1940).

The sediment routing procedure used by the Soil Conservation Service is based upon data developed from studies of reservoir sedimentation. In these studies, the estimated amount of gross erosion in the watershed was related to the quantity of sediment measured in the reservoir. The ratio of sediment yield to gross erosion is called the delivery rate.

Analysis of soil-loss records for some 40,000 storm events at 20 erosion experiment stations in the United States was reported by Musgrave (1947). These studies led to the development of an equation for estimating sheet erosion under variable conditions. Factors considered in the equation are relative soil erodability, land slope, length of slope, intensity, duration, and frequency of rainfall, and a cropping factor. It is obvious that of these factors, the only ones that can be modified are the cropping factor and the length of slope.

As may be seen from table 5, a change from intertilled crops to hay results in a substantial reduction in sheet erosion. Contour plowing, strip cropping, and diversion terraces influence the effective length of slope with a corresponding reduction in erosion.

Table 5.--Estimated relative amount of erosion under different vegetal covers in the Delaware River basin

Cropping practice	Relative erosion
Forest	0.001 - 1.0
Pasture	0.01 - 2.0
Hay	0.3 - 3.0
Corn-oats-hay-hay rotation	13
Corn-oats-hay rotation	22
Continuous row crop	100

Because sheet erosion correlates significantly with the use of the land, table 6 is indicative of the relative opportunity for sheet erosion in the various areas of the Delaware River basin. Conservation survey data were analyzed to determine the relative severity of erosion within each physical subdivision. The physical subdivisions of the basin are areas considered as having similar erosion problems (fig. 1). By combining the data on land use shown in table 6 with the erosion data in table 7, estimates of sheet erosion per square mile for each physical subdivision were developed. These data are given in table 8.

Table 6.--Land use in the Delaware River basin

Physical subdivision		Cropland	Pasture	Woodland	Idle	Urban	Total
1	acres	290,789	130,756	1,866,256	63,312	132,873	2,483,976
	percent	12	5	75	3	5	
2	acres	215,379	39,938	266,984	64,701	26,764	613,766
	percent	35	6	44	11	4	
3	acres	200,700	16,240	336,300	24,700	27,552	605,692
	percent	34	3	54	4	5	
4	acres	296,718	53,828	205,348	22,513	42,508	620,915
	percent	47	9	33	4	7	
5	acres	664,447	116,738	366,663	73,917	175,433	1,397,198
	percent	48	8	27	5	12	
6	acres	630,225	58,601	642,446	113,648	294,602	1,739,522
	percent	36	3	38	7	17	

Table 7.--Estimated average annual rates of sheet erosion by physical subdivision and type of cover

Physical subdivision	Cropland 1/	Pasture	Woods
	(tons per acre)		
1	6.6	1.35	0.5
2	6.2	1.9	1.3
3	6.3	1.3	2.5
4	9.2	0.9	1.2
5	6.9	1.3	1.0
6	2.3	0.3	0.1

1/ Computed as average annual value for rotations used.

Table 8.--Estimated average annual sheet erosion by physical subdivisions in the Delaware River basin

Physical subdivision	Land use			Sheet erosion	
	Type	Percent	Acres per sq mi	Tons per acre	Total tons per sq mi
1	Cropland	12	77	6.6	510
	Pasture [a/]	14	93	1.35	122
	Woods	74	470	0.5	245
				Total	877
2	Cropland	35	224	6.2	1,380
	Pasture [a/]	21	134	1.9	250
	Woods	44	282	1.3	380
				Total	2,010
3	Cropland	34	218	6.3	1,370
	Pasture [a/]	12	77	1.3	100
	Woods	54	345	2.5	865
				Total	2,335
4	Cropland	47	300	9.2	2,770
	Pasture [a/]	20	128	0.9	110
	Woods	33	212	1.2	254
				Total	3,134
5	Cropland	48	306	6.9	2,100
	Pasture [a/]	25	160	1.3	210
	Woods	33	174	1.0	174
				Total	2,484
6	Cropland	36	230	2.3	530
	Pasture [a/]	26	170	0.3	51
	Woods	38	240	0.1	24
				Total	605

a/ Includes idle and urban use

When design criteria were developed for the upstream auxiliary reservoirs in the Delaware River basin, it was observed that the relationship of sediment yield to gross erosion for watersheds of similar sizes was consistent, although the yield varied between physical subdivisions. Delivery rates depend upon many factors. It is obvious that the transport efficiency of a steep, highly channeled watershed will be appreciably higher than that of a flat area. Since it is generally true that the slope of a watershed increases as the size decreases, the delivery rate in small watersheds is usually high, gradually decreasing as the watershed size increases until it becomes a relatively small fraction of the gross erosion on watersheds exceeding 100 square miles in size. Studies by Glymph (1954) and others show that the delivery rate varies inversely as the 0.2 power of the drainage area for large watersheds. John Roehl, geologist, Soil Conservation Service, Spartanburg, S. C., has prepared an average delivery-rate curve with existing data in the United States. This curve (fig. 7) is based on reservoir survey data from very dissimilar physiographic regions. The curve was checked against the limited data available on watersheds in the Delaware River basin and was found to be in reasonably good agreement. Consequently it was adopted for use in computing sediment yields in this area.

It should be noted that land use in an individual watershed may vary appreciably from the data shown in table 6. Physical subdivision 1, for example, covers about 3,900 square miles. There are entire watersheds within this area with significantly different land use than that shown for the physical subdivision. Bush Kill above Stroudsburg, Pa., for example, has about 90 percent woodland, 8 percent pasture grassland, and 2 percent cropland. Table 6 shows that this physical subdivision is 75 percent woodland, 13 percent pasture (including idle and urban areas), and 12 percent cropland. It is significant that the average use of the land becomes more nearly the average for the physical subdivision as the watershed size increases. Conversely, the deviation from the average may be significant for small watershed areas.

The tabulation of sediment yield by tributaries (table 9) was developed from estimates of the land use within the watersheds, the erosion data given in table 7, and the delivery rate from figure 7. This tabulation is intended to indicate the magnitude of the sediment yield from various tributary areas. Variation from the true amount of sediment produced may be appreciable, if the land use or slopes are significantly different from the generalized data used to develop the table.

Table 9.--Estimated sediment yield rates for principal tributaries of the Delaware River

Tributary	Drainage area (sq mi)	Cover (percent)			Sheet erosion (tons per sq mi)	Delivery rate (percent)	Average annual sediment yield (tons per sq mi)
		Crop	Grass	Woods			
East Branch Delaware River	840	12	14	74	877	4.4	39
West Branch Delaware River	664	12	14	74	877	4.8	42
Equinunk Creek	58	12	14	74	877	11.2	98
Lackawaxen River	601	24	46	30	1,490	5.0	74
Mongaup River	202	2	8	90	441	7.5	33
Neversink River	346	2	8	90	441	6.2	27
Bush Kill (Stroudsburg)	156	2	8	90	441	8.2	36
Brodhead Creek	287	12	14	74	877	6.6	58
Paulins Kill	177	35	21	44	2,010	7.8	157
Pequest River	158	35	21	44	2,010	8.1	163
Lehigh River	1,364	31	18	51	2,210	4	88
Musconetcong River	158	31	36	33	1,812	8.1	147
Assunpink Creek	91	36	26	38	605	9.7	59
Neshaminy Creek	233	48	25	27	2,484	7.1	176
Rancocas Creek	342	36	26	38	605	6.2	38
Perkiomen Creek [a/]	362	25	45	30	1,620	6.0	97
Schuylkill River	1,909	44	19	37	2,650	3	80
Chester Creek	66	48	25	27	2,480	10.7	265
Brandywine Creek [b/]	329	48	25	27	2,480	6.4	159
Christina River	568	--	--	--	1,720	5.1	88
Salem River	112	36	26	38	605	9.0	54

a/ Tributary to Schuylkill River
b/ Tributary to Christina River

SOURCES OF SEDIMENT

For simplicity, erosion may be classified as sheet erosion and channel erosion. Sheet erosion is the removal of material from the land surface by prechannel or overland flow; channel erosion occurs as a result of concentrated flow. The important factors influencing rate of channel erosion are the stream gradient, size and nature of bed and bank materials, the hydraulic characteristics of the flow and the amount of sediment in transport. Qualitative measurements of the rate and extent of this type erosion in the basin were made by field observations and examination of aerial photographs. Two series of photographs were available for study, one made during 1936-37 and the other made during 1953-54.

There were few gullies in the basin. A study of Brandywine Creek (USDA, 1952) shows that gullies account for about 1 percent of the gross erosion. On the basis of reconnaissance surveys and observations, gullies are thought to be no more severe in the remainder of the Delaware River basin.

Meandering of streams and migration of channels vary appreciably throughout the basin. A study of Brandywine Creek by Wolman (1955) indicates that streambank erosion is very moderate in this tributary. In the steep upland areas, on the other hand, channel erosion, bank scour and deposition are considered to be the principal sediment problems.

Sediments deposited in the upper portion of the basin are predominantly coarse materials. Although the movement of these materials is perhaps less continuous than that of finer particles, the quantities transported during major storms can attain appreciable proportions. The transport and deposition of large quantities of coarse sediments during the hurricane floods of 1955 caused the abandonment of much fertile agricultural land in the floodplains. Deposition in some reaches of streams adjacent to highways reduced the flood-carrying capacity of the channels so as to require raising the highways as much as 6 to 10 feet in order to obtain protection from even the frequent floods.

SEDIMENT ACCUMULATION IN RESERVOIRS

As water enters a reservoir its velocity and turbulence are reduced, thus causing deposition of some sediment in transport. Sediment accumulation in reservoirs depends upon many factors, such as reservoir shape, ratio of reservoir capacity to drainage area, water retention time, and variation in water level. These influences, as well as the load and sediment particle size are considered in predicting the rate of sediment accumulation in proposed reservoirs. To provide a

guide in appraising the extent of sediment accumulation in four typical reservoirs studied in the Delaware basin, the estimates given in table 10 were prepared. It can be seen from table 10 that sediment accumulation for a 50-year period will likely occupy a relatively insignificant portion of the storage in the proposed reservoirs.

Table 10.--Estimated sediment accumulation in typical multi-purpose reservoirs under study in the Delaware River basin

Reservoir	Drainage area (sq mi)	Pool capacity (acre-ft)	Annual erosion (tons per sq mi)	Delivery rate (percent)	Annual sediment yield (tons per sq mi)	Sediment accumulation (acre feet)	
						Average annual 1/	50 years
Tocks Island	2,912	635,000	877	5.6	49	134.0	6,700
Sterling	143	50,500	877	9	79	10.6	530
Tobyhanna	224	87,000	877	8.4	73.5	16.5	825
Bernville	129	94,000	3,134	9.4	294	35.5	1,775

1/ Estimated at 50 pounds per cubic foot

Sediment accumulation in the smaller, upstream reservoirs will be more significant. The procedure accepted for design of these structures locates the principal spillway at an elevation that will accomodate the estimated accumulation of sediment during a 50-year period. At the time the procedure was developed, more than 350 reservoirs of this type were under consideration, and it was obviously impractical to develop sediment-design criteria for each structure. Consequently, a method of estimating average sediment accumulation by physical subdivision was developed.

Sedimentation data is available for about 45 reservoirs in the general physiographic regions represented in the Delaware River basin, but only two of these are in the basin. By plotting these data, supplemented by field studies of sample reservoir sites and theoretical considerations, it was possible to develop generalized sedimentation curves for each of three groups of the physical subdivisions shown in figure 1. These curves (figs. 9, 10, and 11) are combined in a single diagram in figure 8, which is intended to provide an estimate for planning purposes only of the sediment inflow to a reservoir.

To use the curves, it is necessary to know the watershed size in square miles and the physical subdivision (fig. 1) in which it is located. By entering the sedimentation diagram (fig. 8) with the drainage area in square miles, reading up to the curve corresponding to the location of the reservoir, and then left to the rate scale, the average annual volume in acre-feet per square mile is obtained. This value is multiplied by the area of the watershed in square miles and the number of years to obtain an estimate of the accumulation for any desired period.

The estimate obtained from the curves in figure 8 should be considered an average for rather large areas. Variations from the average are expected to be appreciable at specific sites. For this reason, it will be necessary to recompute the sediment data when detailed designs are made for individual sites.

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Table 11.--Suspended-sediment data for Geological Survey stations in the Delaware River basin

Date	Time	Stream discharge (cfs)	Concentration of sample (ppm)	Suspended-sediment discharge in tons per day
East Branch Delaware River at Fishs Eddy, N. Y.				
Oct. 25, 1956	2:00 p.m.	742	3	6
Nov. 2	7:20 p.m.	3,480	43	404
Dec. 16	12:30 p.m.	3,030	12	98
Dec. 17	2:00 p.m.	2,640	10	71
Dec. 18	11:45 a.m.	2,170	8	47
Mar. 11, 1957	1:00 p.m.	590	7	11
Apr. 7	2:30 p.m.	5,000	14	189
Apr. 8	5:15 p.m.	3,600	5	49
Apr. 9	9:30 a.m.	3,100	8	67
May 6	11:00 a.m.	540	1	1
May 20	8:30 p.m.	3,800	45	462
May 21	9:00 a.m.	4,000	18	194
May 22	9:45 a.m.	2,600	4	28
May 28	2:15 p.m.	760	2	4
June 14	8:30 a.m.	1,050	2	6
Dec. 17	12:40 p.m.	790	4	8
Dec. 21	9:15 a.m.	25,500	455	31,300
Dec. 22	9:15 a.m.	5,900	30	478
West Branch Delaware River at Hale Eddy, N. Y.				
Sept. 26, 1956	11:00 a.m.	2,000	12	65
Oct. 25	1:15 p.m.	347	3	3
Nov. 2	6:00 p.m.	930	18	45
Dec. 16	11:30 a.m.	4,260	41	472
Dec. 17	1:00 p.m.	3,730	27	272
Dec. 18	1:00 p.m.	3,030	15	123
Mar. 11, 1957	11:30 a.m.	610	6	10
Apr. 7	1:45 p.m.	5,170	27	377
Apr. 8	6:00 p.m.	4,120	11	122
Apr. 9	9:00 a.m.	3,360	10	91
May 6	10:10 a.m.	470	2	2
May 20	9:30 p.m.	6,100	111	1,830
May 21	8:15 a.m.	5,720	56	865
May 22	9:00 a.m.	3,750	17	172
May 28	1:30 p.m.	1,080	10	29
June 14	9:25 a.m.	358	2	2
Dec. 17	11:45 a.m.	664	5	9
Dec. 21	8:00 a.m.	9,590	313	8,100
Dec. 22	8:15 a.m.	5,420	41	600

Table 11.--Suspended-sediment data for Geological Survey stations in the Delaware River basin--Continued

Date	Time	Stream discharge (cfs)	Concentration of sample (ppm)	Suspended-sediment discharge in tons per day
Delaware River near Barryville, N. Y.				
Sept. 26, 1956	8:20 a.m.	4,010	52	563
do	9:00 a.m.	4,390	56	664
Oct. 25	4:10 p.m.	1,200	4	13
Nov. 2	10:30 p.m.	3,700	17	170
Nov. 3	11:00 a.m.	6,600	28	499
Dec. 16	2:30 p.m.	12,900	25	871
Dec. 17	11:00 a.m.	13,300	35	1,260
Dec. 18	10:15 a.m.	10,300	23	640
Dec. 19	9:00 a.m.	8,050	10	217
Mar. 11, 1957	2:40 p.m.	2,200	7	42
Apr. 7	4:00 p.m.	20,500	60	3,320
Apr. 8	3:00 p.m.	15,100	28	1,140
Apr. 9	11:15 a.m.	14,200	21	805
May 6	1:00 p.m.	1,640	1	4
May 20	6:00 p.m.	6,310	14	239
May 21	11:00 a.m.	12,900	59	2,050
May 22	11:15 a.m.	9,510	18	462
June 13	1:30 p.m.	785	2	4
Dec. 17	2:50 p.m.	2,140	2	12
Dec. 21	11:45 a.m.	49,000	424	56,000
Dec. 22	11:15 a.m.	22,600	77	4,700
Lackawaxen River at Hawley, Pa.				
Dec. 17, 1957	3:55 p.m.	250	12	8
Dec. 20	8:25 p.m.	2,500	466	3,140
Dec. 21	1:00 p.m.	4,700	181	2,300
Dec. 22	12:05 p.m.	2,070	27	151
Neversink River at Godeffroy, N. Y.				
Nov. 3, 1956	12:15 a.m.	599	38	62
do	12:30 p.m.	414	15	17
Dec. 16	3:30 p.m.	985	45	120
Dec. 17	10:00 a.m.	1,120	48	145
Dec. 18	9:15 a.m.	889	97	233
Dec. 19	10:10 a.m.	658	10	178
Mar. 11, 1957	4:00 p.m.	340	43	39
Apr. 7	5:30 p.m.	1,670	16	72

Table 11.--Suspended-sediment data for Geological Survey stations in the Delaware River basin--Continued

Date	Time	Stream discharge (cfs)	Concentration of sample (ppm)	Suspended-sediment discharge in tons per day
Neversink River at Godeffroy, N. Y.--Continued				
Apr. 8, 1957	12:00 m.	1,500	13	53
Apr. 9	12:30 p.m.	1,680	12	54
May 6	2:30 p.m.	180	3	1
May 20	4:30 p.m.	305	4	3
May 21	12:45 p.m.	480	8	10
May 22	12:30 p.m.	310	4	3
May 29	10:15 a.m.	185	2	1
June 13	12:20 p.m.	83	2	0.4
Dec. 17	5:05 p.m.	218	16	9
Dec. 20	5:40 p.m.	844	74	169
Dec. 21	3:00 p.m.	2,900	69	540
Bush Kill at Shoemakers, Pa.				
Dec. 18, 1957	9:05 a.m.	114	1	0.3
Dec. 20	3:30 p.m.	615	192	319
do	4:00 p.m.	670	110	199
Dec. 21	4:30 p.m.	2,410	36	234
Dec. 22	1:30 p.m.	1,380	9	34
Musconetcong River near Bloomsbury, N. J.				
Dec. 18, 1957	11:35 a.m.	138	4	1
Feb. 28, 1958	8:15 a.m.	2,090	635	3,590
do	9:55 a.m.	2,030	530	2,900
do	5:10 p.m.	1,250	153	526
Tohickon Creek near Pipersville, Pa.				
Dec. 18, 1957	1:30 p.m.	44	2	0.2
Feb. 28, 1958	6:10 a.m.	5,470	446	6,590
do	11:30 a.m.	4,450	440	5,300
do	7:10 p.m.	2,010	235	1,790

Table 11.--Suspended-sediment data for Geological Survey stations in the Delaware River basin--Continued

Date	Time	Stream discharge (cfs)	Concentration of sample (ppm)	Suspended-sediment discharge in tons per day
Neshaminy Creek near Langhorne, Pa.				
Nov. 7, 1956	1:50 p.m.	166	9	4
Dec. 10	4:20 p.m.	391	28	30
Dec. 14	11:45 a.m.	800	84	181
do	3:45 p.m.	1,775	174	834
Dec. 15	10:00 a.m.	2,950	218	1,740
do	2:20 p.m.	1,620	138	598
Dec. 16	10:50 a.m.	2,040	92	507
Jan. 23, 1957	9:00 a.m.	380	1,580	1,620
do	1:30 p.m.	770	870	1,810
Feb. 2	5:00 p.m.	164	729	323
Feb. 4	5:05 p.m.	436	776	914
Mar. 9	11:45 a.m.	2,400	301	1,950
do	4:10 p.m.	2,580	262	1,820
Apr. 5	4:20 p.m.	5,040	606	8,250
do	6:45 p.m.	4,670	631	7,960
do	11:15 p.m.	3,250	883	7,750
Apr. 6	11:35 a.m.	5,300	1,460	20,900
Dec. 21	11:00 a.m.	7,330	405	8,020
do	4:35 p.m.	2,000	405	2,190
do	9:30 p.m.	1,150	178	553
Dec. 26	7:00 p.m.	4,550	652	8,010
do	12:00 p.m.	5,170	440	6,140
Dec. 27	4:45 a.m.	3,450	499	4,650
do	11:45 a.m.	1,520	104	427
Jan. 14, 1958	9:00 p.m.	1,520	803	3,300
Jan. 15	5:00 p.m.	1,270	236	809
Jan. 22	8:45 a.m.	4,550	1,962	24,100
do	6:15 p.m.	2,130	576	3,310
do	9:30 p.m.	1,600	404	1,740
Jan. 25	5:10 p.m.	5,170	1,348	18,800
do	10:00 a.m.	2,490	1,580	10,600
do	1:00 p.m.	4,550	1,700	20,900
do	4:20 p.m.	5,040	1,420	19,300
do	7:00 p.m.	5,300	1,180	16,900
Jan. 27	11:30 a.m.	763	125	258
Jan. 28	1:00 p.m.	11,000	1,350	40,000

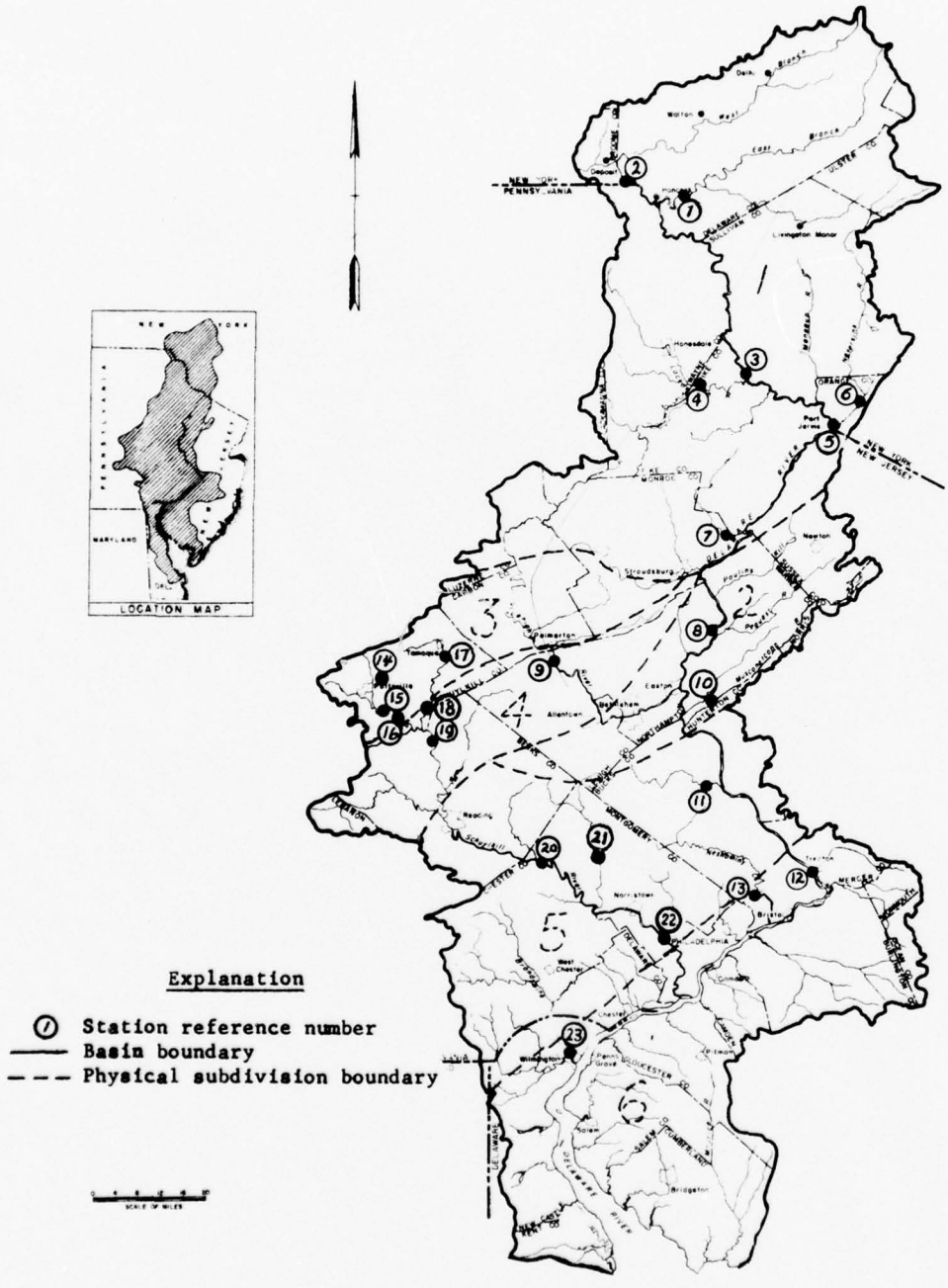


Figure 1. Map showing location of sediment sampling stations and physical subdivisions in the Delaware River basin.

Reference No. 1/	Sediment station	Drainage area (sq mi)	Water years 1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
1	East Branch Delaware River at Fishs Eddy, N.Y.	783											▨	▨
2	West Branch Delaware River at Hale Eddy, N.Y.	593											▨	▨
3	Delaware River near Barryville, N.Y.	2,023												▨
4	Lackawaxen River at Hawley, Pa.	290												▨
5	Delaware River at Port Jervis, N.Y.	3,076											▬	▬
6	Neversink River at Goddeffroy, N. Y	302											▨	▨
7	Bush Kill at Shoemakers, Pa.	117												▨
8	Delaware River at Belvidere, N.J. 2/	4,377											▨	▨
9	Lehigh River at Walnutport, Pa.	889		▬	▬	▬	▬	▬	▬				▨	▨
10	Musconetcong River near Bloomsbury, N.J.	143												▨
11	Tohickon Creek near Pipersville, Pa.	97.4												▨
12	Delaware River at Trenton, N.J.	6,780			▬	▬	▬	▬	▬	▬	▬	▬	▬	▬
13	Neshaminy Creek near Langhorne, Pa.	210											▨	▨
14	Schuylkill River at Port Carbon, Pa.	27.1			▬	▬								
15	Schuylkill River at Landingville, Pa.	133		▬	▬	▬	▬	▬	▬					
16	Schuylkill River at Auburn, Pa.	157		▬	▬	▬	▬							
17	Little Schuylkill River at S. Tamaqua, Pa.	69.6				▬	▬	▬	▬					
18	Little Schuylkill River at Drehersville, Pa.	122		▬	▬	▬	▬							
19	Schuylkill River at Berne, Pa.	355		▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬
20	Schuylkill River at Pottstown, Pa.	1,147			▬	▬	▬	▬						
21	Perkiomen Creek at Graterford, Pa.	279			▬	▬	▬	▬	▬					
22	Schuylkill River at Manayunk, Philadelphia, Pa.	1,893		▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬
23	Brandywine Creek at Wilmington, Del.	314	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬

1/ Numbers refer to Figure 1

2/ Above Pequest River

▬ Daily sampling ▨ Intermittent sampling

Figure 2. Periods of operation of sediment stations in the Delaware River basin

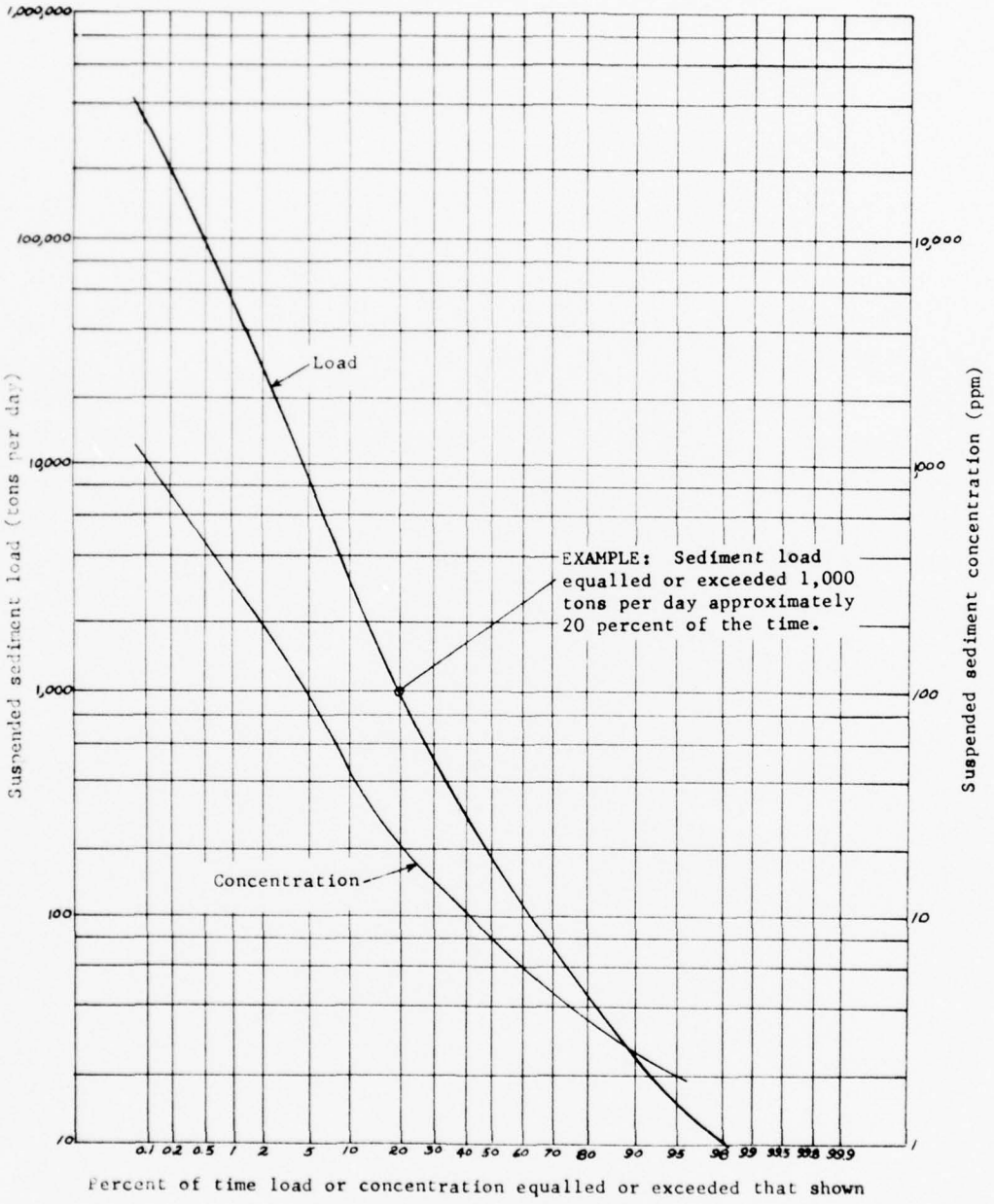


Figure 3 Duration curve of suspended sediment load and concentration for Delaware River at Trenton, N.J., September 1949 to September 1956

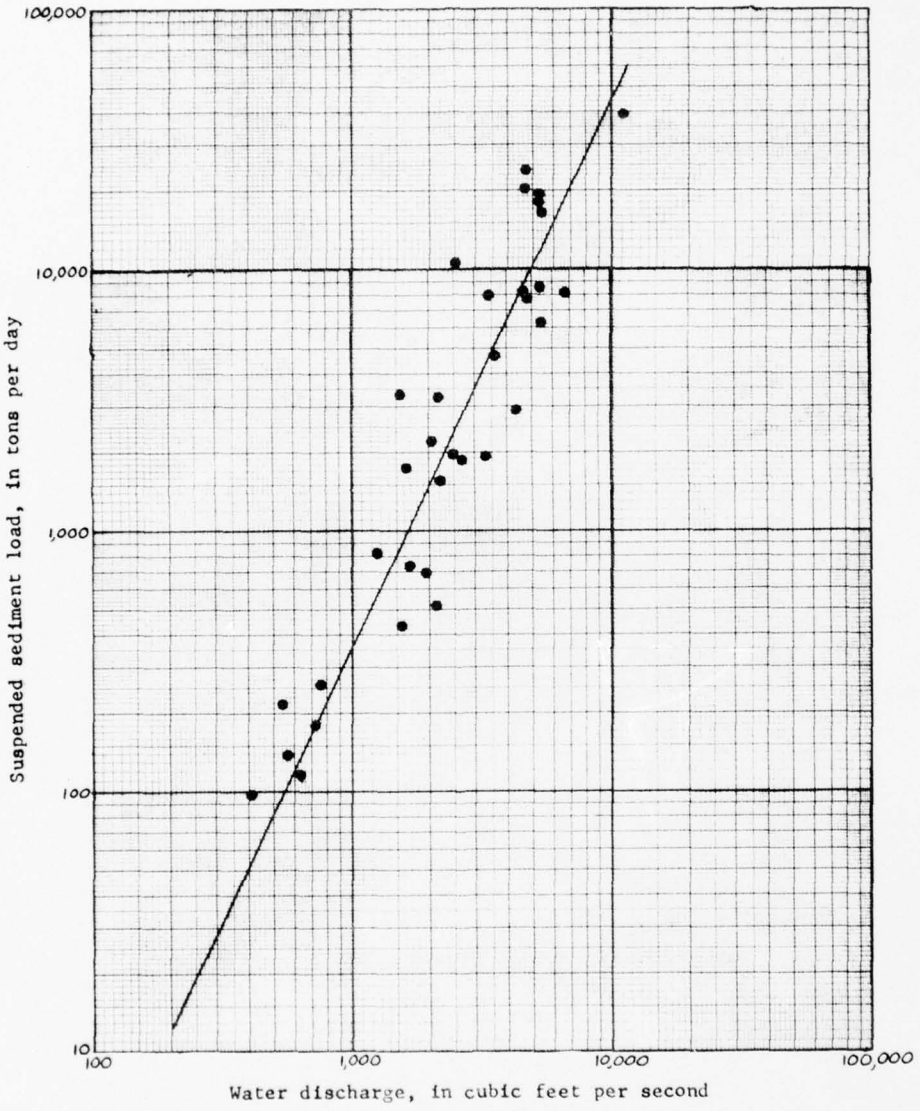


Figure 4 Relation of sediment load to water discharge, Neshaminy Creek near Langhorne, Pa.

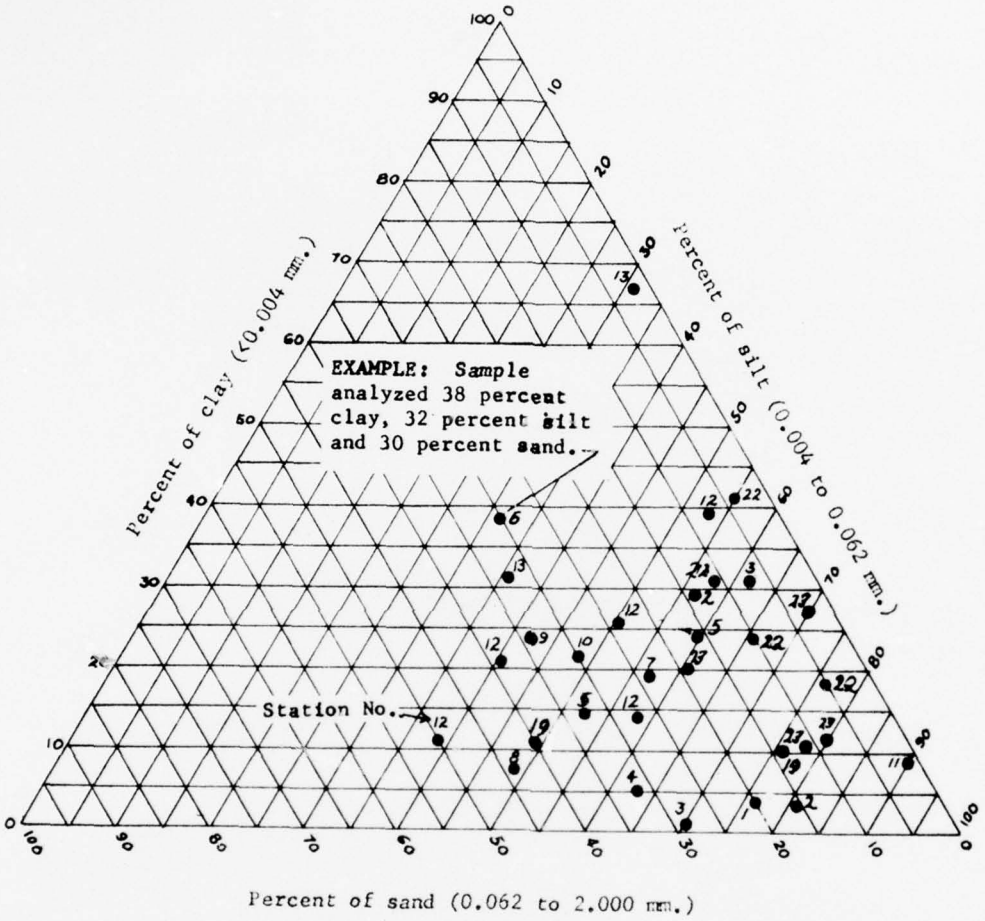


Figure 5 Percentages of clay, silt, and sand in suspended sediment samples of streams.

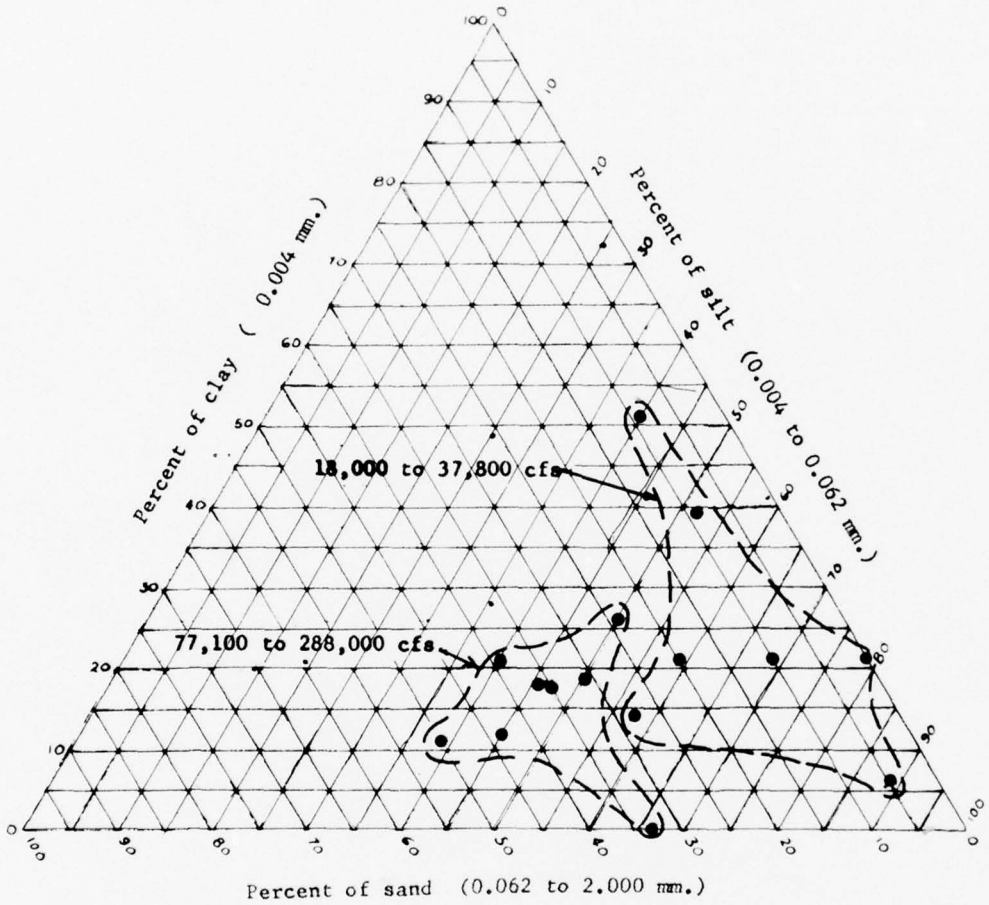


Figure 6 Percentages of clay, silt, and sand in suspended sediment samples of Delaware River at Trenton, N. J.

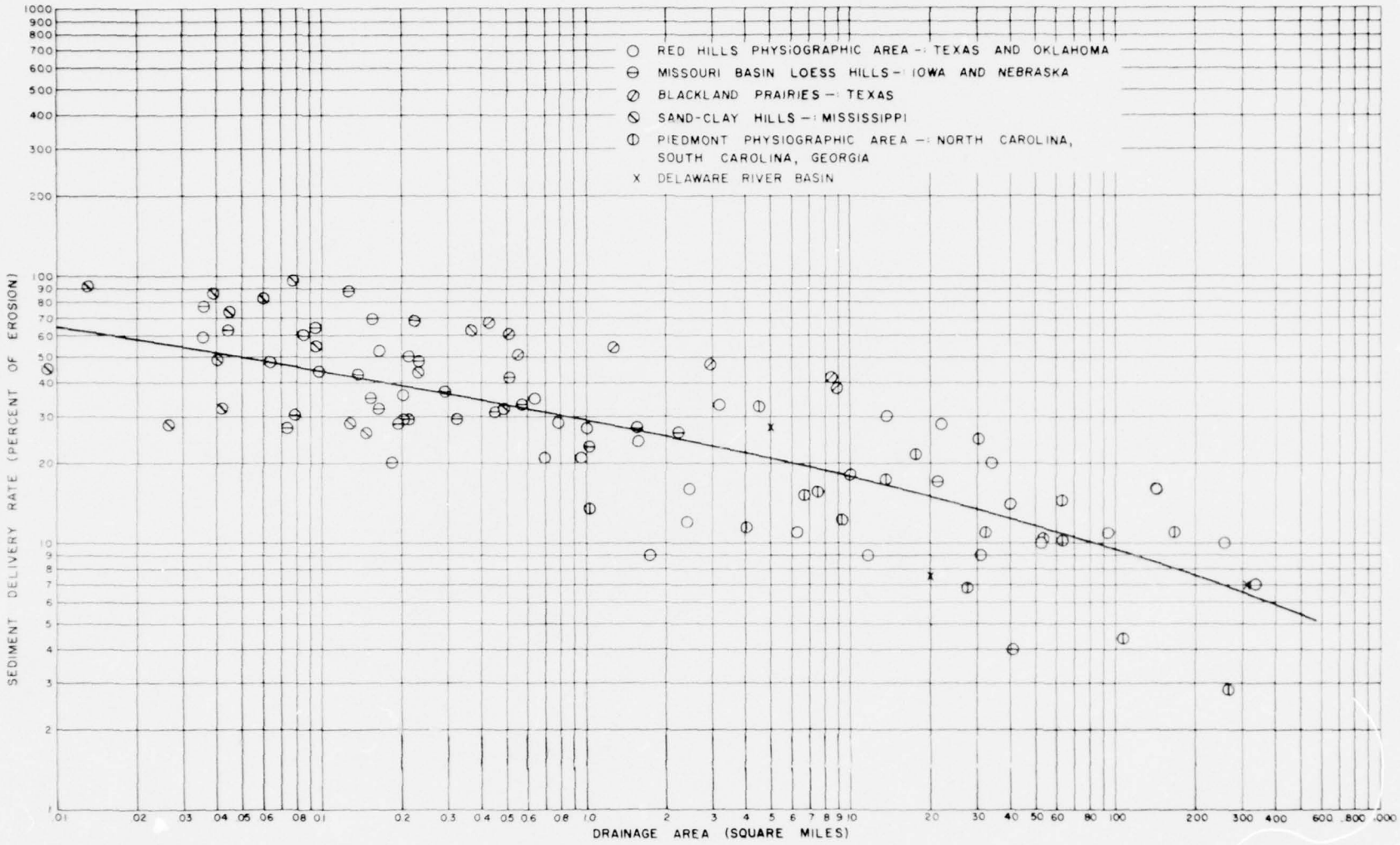
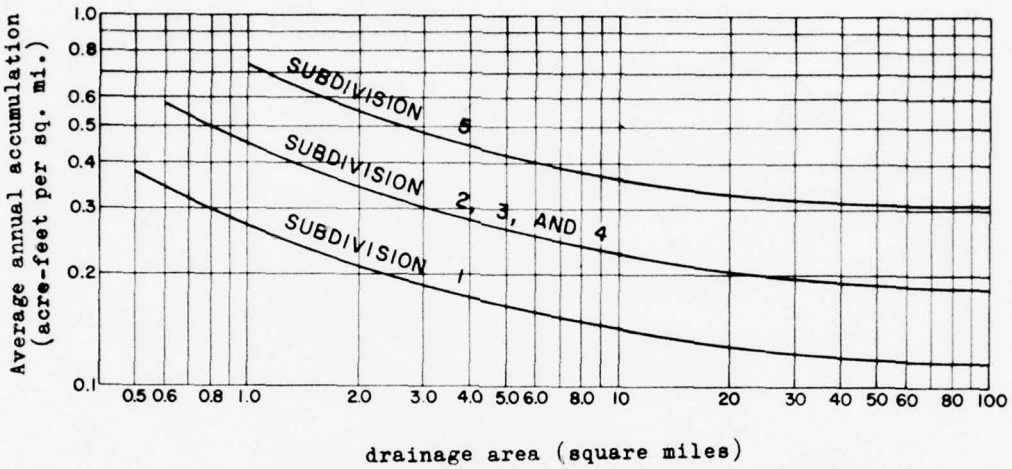
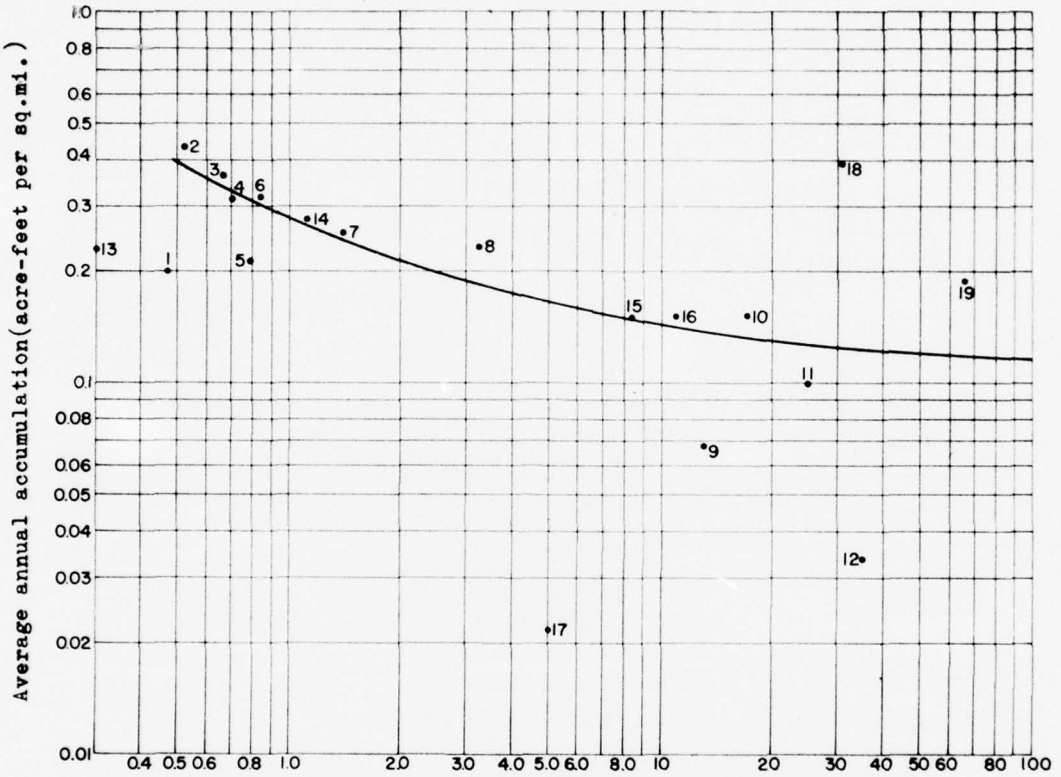


Figure 7. Delivery rate curve for the Delaware River basin.



Note - The data on which these curves are based are shown in Figures 9-11.

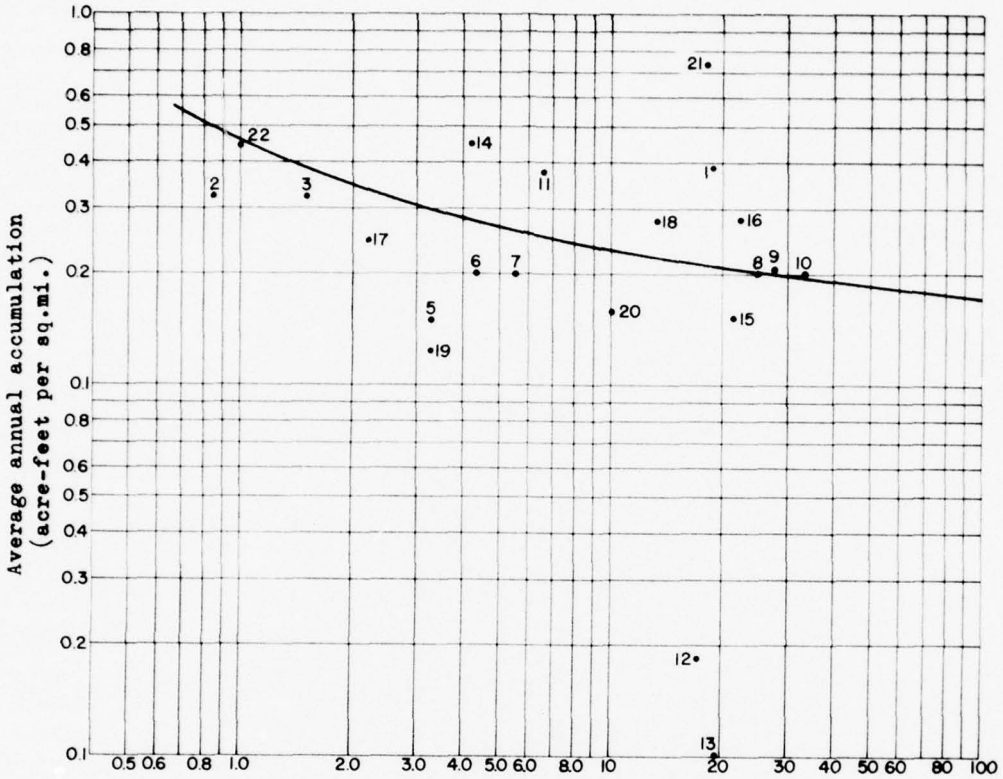
Figure 8. Generalized curves of reservoir sedimentation in the Delaware River basin.



1. Laurella Brook Site 8 1/
2. Indian Orchard Site 9 1/
3. " " Site 12 1/
4. White Mills Site 11 1/
5. Laurella Brook Site 7 1/
6. Carley Brook Site 13 1/
7. Laurella Brook Site 3 1/
8. Griffin Reservoir 1/
9. Scranton No. 7 Reservoir
10. Watres Reservoir
11. Toronto Lake
12. Elmhurst Reservoir
13. Pelto Dam, Dean Creek, N.Y.
14. Pylkas Dam, " " " "
15. Huntsville Reservoir
16. Pikes Creek
17. Williams Bridge
18. Arkport Reservoir
19. Canadaraga Reservoir

1/ Data from Sediment Design Summary Sheets, 566 watershed plans

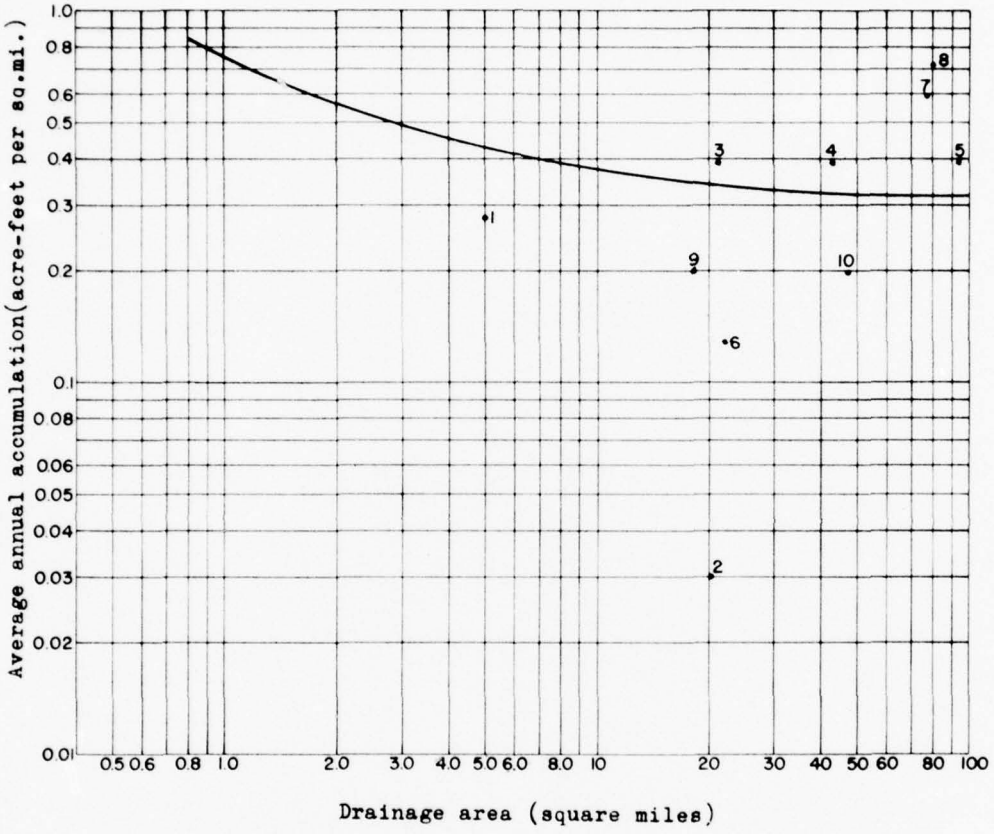
Figure 9. Generalized curve of reservoir sedimentation in physical subdivision 1.



1. Ontelaunee Reservoir
2. Lebanon No. 5 1/
3. Wernersville No. 3 1/
4. Reading (Oley)
5. Mohawk Lake
6. Echo Lake Coffers Brook
7. Canistear Reservoir Pacock Br.
8. Clinton Reservoir
9. Lake Hopatcong
10. Greenwood Lake
11. Tomahannok
12. Columbia Reservoir
13. Wappinger Creek
14. Quakertown No. 12
15. Clarks Creek
16. Wild Creek
17. Hosensock Creek
18. Locust Creek
19. Pottsville No. 2
20. Pine Run No. 2
21. Site No. 1 Little Schuylkill River
22. Site No. 2 Little Schuylkill River

1/ Data from sediment design sheets, upstream reservoirs, Delaware River basin.

Figure 10. Generalized curve of reservoir sedimentation in physical subdivisions 2, 3, and 4.



1. Coatesville Reservoir Rock Run
2. Icedale Reservoir
3. Geist (Springton) Reservoir
4. Lake Williams
5. Indian Rock, Codorus Creek
6. Edgar Hooper Reservoir
7. Brighton Reservoir
8. Prettyboy Reservoir
9. Lock Raven Reservoir
10. Carnegie Reservoir

Figure 11. Generalized curve of reservoir sedimentation in physical subdivision 5.

REPORT ON THE

COMPREHENSIVE SURVEY

OF THE

WATER RESOURCES

OF THE

DELAWARE RIVER BASIN

APPENDIX I

RECREATION RESOURCES

PREPARED BY

NATIONAL PARK SERVICE

FOR

U. S. ARMY ENGINEER DISTRICT, PHILADELPHIA
CORPS OF ENGINEERS
PHILADELPHIA, PA.

(Reprinted November 1961)

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PURPOSE AND AUTHORITY

Pursuant to resolutions adopted by the Public Works Committee of the United States Senate, the Corps of Engineers of the Department of the Army was directed to conduct a comprehensive survey of the water resources of the Delaware River in the States of Delaware, New Jersey, New York, and Pennsylvania in the interest of flood control, navigation, water supply, stream pollution abatement, recreation, control of the movement of salt water, electric power, and other purposes.

The assignment to formulate a comprehensive plan for the control of water resources of the Delaware River Basin was delegated to the District Engineer at Philadelphia who sought the cooperation of other agencies, the States, and interstate organizations responsible for the functions and activities to be embraced by the plan. The function of the Corps of Engineers in carrying out this assignment was that of a coordinator in the development of the comprehensive plan.

With this concept in mind, the District Engineer arranged for the cooperation of the four Delaware River Basin States and other agencies on the following basis:

(1) Federal agencies normally responsible for those functions and activities of the Federal Government to be embraced by the plan were invited to cooperate in its preparation and to develop those segments of the over-all plan falling within the fields for which those agencies bear the primary Federal responsibility. The Corps of Engineers made assignments to the cooperating Federal agencies and expected those agencies to assume full responsibility for carrying out the assignments, and for the reports and the recommendations resulting therefrom. The reports of the cooperating agencies accompanying the final report of the Corps of Engineers, and the recommendations of the various agencies are summarized in the body of that report. To the extent necessary to bring about the development of a coordinated and harmonious basin plan, to resolve differences between various agencies and interests, or to take into account the views of the States, the Corps of Engineers reserved the right in its final report to make recommendations at variance with those of a cooperating Federal agency. In such an event, the report indicates the difference between the recommendation of the Corps of Engineers and that of the cooperating agency. The Corps of Engineers provided funds to cooperating Federal agencies for carrying out such parts of the work assigned them and that would not otherwise be undertaken during the planning period.

(2) The States of the Delaware River Basin were invited to cooperate directly with the Corps of Engineers in developing the over-all plan. Each Federal cooperating agency was authorized to invite State cooperation within the scope of that agency's assignment.

(3) For the purpose of resolving problems of mutual interest to

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the several Federal agencies and States, a coordinating committee was established at the field level with the representative of the Corps of Engineers as Chairman.

In accordance with correspondence and conferences between the National Park Service, Department of the Interior, and the Corps of Engineers, Department of the Army, a plan of procedure was agreed upon for the participation of the National Park Service in the comprehensive survey of the water resources of the Delaware River Basin. By letter dated September 17, 1956, the Corps of Engineers requested the National Park Service to undertake the collection of data and to make the studies programmed by prior agreement.

The National Park Service was requested to carry out studies and investigations necessary for the development of plans to provide for the preservation and utilization of the scenic, natural, cultural, and other recreation resources of the Delaware River Basin; to coordinate such plans with other land and water use plans; make determinations of the historic and archaeological values that will be lost forever by dam construction and subsequent inundation and indicate appropriate measures to protect or salvage those objects of unusual interest.

The authority for participation by the National Park Service in the comprehensive survey of the water resources of the Delaware River Basin is contained in the President's letter of October 22, 1956, to the Secretary of the Army and in the Park, Parkway and Recreation Area Study Act of June 23, 1936.

ACKNOWLEDGEMENTS

The data, conclusions and recommendations contained in this Appendix are based upon the studies and investigations conducted by the National Park Service in its study of the non-urban recreation resources of the Delaware River Basin. The Service is indebted to the many Federal, State, county, and municipal agencies, private organizations and individuals who contributed valuable information, time and constructive suggestions. Although they are too numerous to name individually, special recognition should be extended to the State Park Commission and the Board of Game and Fish Commissioners of the State of Delaware, the New Jersey Department of Conservation and Economic Development, the Department of Conservation of the State of New York, the Pennsylvania Department of Forests and Waters, the United States Coast Guard, the Delaware River Basin Advisory Committee, the Federal Reserve Bank of Philadelphia, and the Interstate Commission on the Delaware River Basin.

Population and economics data were extracted from Economic Base Survey, Appendix I, prepared by the United States Department of Commerce, Office of Business Economics, for the comprehensive survey of the resources of the Delaware River Basin.

Data concerning resort economics were derived from studies and publications by the Federal Reserve Bank of Philadelphia and used by special permission of that organization.

All illustrations and photographs, unless otherwise credited, are by the National Park Service.

I - THE DELAWARE RIVER BASIN

GENERAL

1. The Delaware River Basin and the adjoining territory to which it is economically attached has been aptly referred to as the heart of the northeastern section of the United States. "Delaware Valley, U.S.A." has been adopted to signify the collective importance of this great river basin, which occupies a part of each of four of the Nation's important industrial States - New York, New Jersey, Pennsylvania, and Delaware.

2. The Delaware River Basin is one of the Nation's most useful and major river watersheds, now and potentially. From its watersheds in the Catskill Mountains in New York, the Poconos in Pennsylvania, and the Kittatinny Mountains in New Jersey, its water and land resources constitute valuable assets of the region and the Nation.

3. The upper one-third of the Basin's 12,765 square miles is renowned for its scenic qualities and recreation assets, and is an unsurpassed source of potable water for the great cities of the region.

4. The central section, extending from Delaware Water Gap to Trenton, comprises a region that is predominantly agricultural. It includes the Lehigh River Valley, noted for its anthracite coal fields and steel and cement industries.

5. The portion of the Basin from Trenton, New Jersey to Wilmington, Delaware encompasses one of the largest and most strategically situated fresh water harbors in America. Here, too, is located one of the most highly diversified and productive industrial areas in the world.

6. Below Wilmington, as the river widens to form Delaware Bay, is an oyster producing area of outstanding value on both the Delaware and New Jersey shores. This industry has operated continuously for more than 200 years.(1) Valuable fisheries also exist here for both finfish and shellfish.

THE RIVER

7. The East and West Branches of the Delaware River rise on the western slopes of the Catskill Mountains and flow southwesterly to make right-angle turns in a valley descending southeasterly to Port Jervis, New York. In this valley, the West Branch is joined by the East Branch near Hancock, New York to form the main stream of the Delaware River. From its source to the mouth of Delaware Bay between Cape May, New Jersey and Cape Henlopen, Delaware, the flowing waters travel a distance of 350 miles.

8. The main channel of the river at Hancock is about 890 feet above sea level. It descends southeasterly to elevation 420 at Port Jervis, where it is joined by the Neversink River, flowing southwesterly out of

New York. Descending southwesterly to Wallpack Bend, the river cuts through a limestone ridge on the northwest slope of the Kittatinny Mountains and continues to flow southwesterly to Stroudsburg, Pennsylvania, where it makes another right-angle turn and cuts through the Kittatinny Range to form Delaware Water Gap. Below the Gap, the river meanders through lower lands, receives the Lehigh River water between Easton, Pennsylvania and Phillipsburg, New Jersey, then cuts southeasterly across several ridges to elevation 40 immediately above Trenton Falls.

9. Below Trenton, the river makes another right-angle turn and flows southwesterly into the northwest end of Delaware Bay. This section of the river and Delaware Bay form the natural tidal estuary of the Delaware River.(1)

THE TRIBUTARIES

10. The principal tributaries of the Delaware River in New York are the West Branch; the East Branch and its principal tributary, the Beaver Kill; the Mongaup River; and the Neversink River, including its tributary, Basher Kill.

11. In Pennsylvania, the principal tributaries are the Lackawaxen River, Bushkill Creek, Lehigh River, Tohickon Creek, Neshaminy Creek, and the Schuylkill River, including its tributary, Perkiomen Creek.

12. The principal tributaries in the northerly part of the New Jersey section of the Delaware Basin are Flat Brook, Paulins Kill, the Pequest and Musconetcong Rivers, and Rancocas Creek, which enters the Delaware River between Trenton and Philadelphia and drains a sizable area in central New Jersey. Cohansey and Maurice Rivers drain the southern portion of the State and flows into Delaware Bay in the vicinity of the area noted for its oyster beds.

13. In Delaware, the principal tributary is Brandywine Creek, which rises in Pennsylvania and enters the Christina River at Wilmington a short distance above its confluence with the Delaware River.(1)

THE BASIN

14. The section of the Basin above Port Jervis is largely a forested and mountainous area with relatively thin soil cover and swift-flowing streams. The Catskill Mountains, in the northwestern part, rise to an elevation of about 3,500 feet above sea level, and the Pocono Mountains, in the southeastern part, rise to elevation of about 2,000 feet. The valleys of this region were filled with heavy deposits of drift and till during the glacial period and subsequent erosion has removed only a portion of these deposits.

15. Between Port Jervis and Delaware Water Gap, the tributary rivers and valleys extend in a generally northeast-southwest direction, and the main channel of the river pierces the mountains in canyon-like gaps.

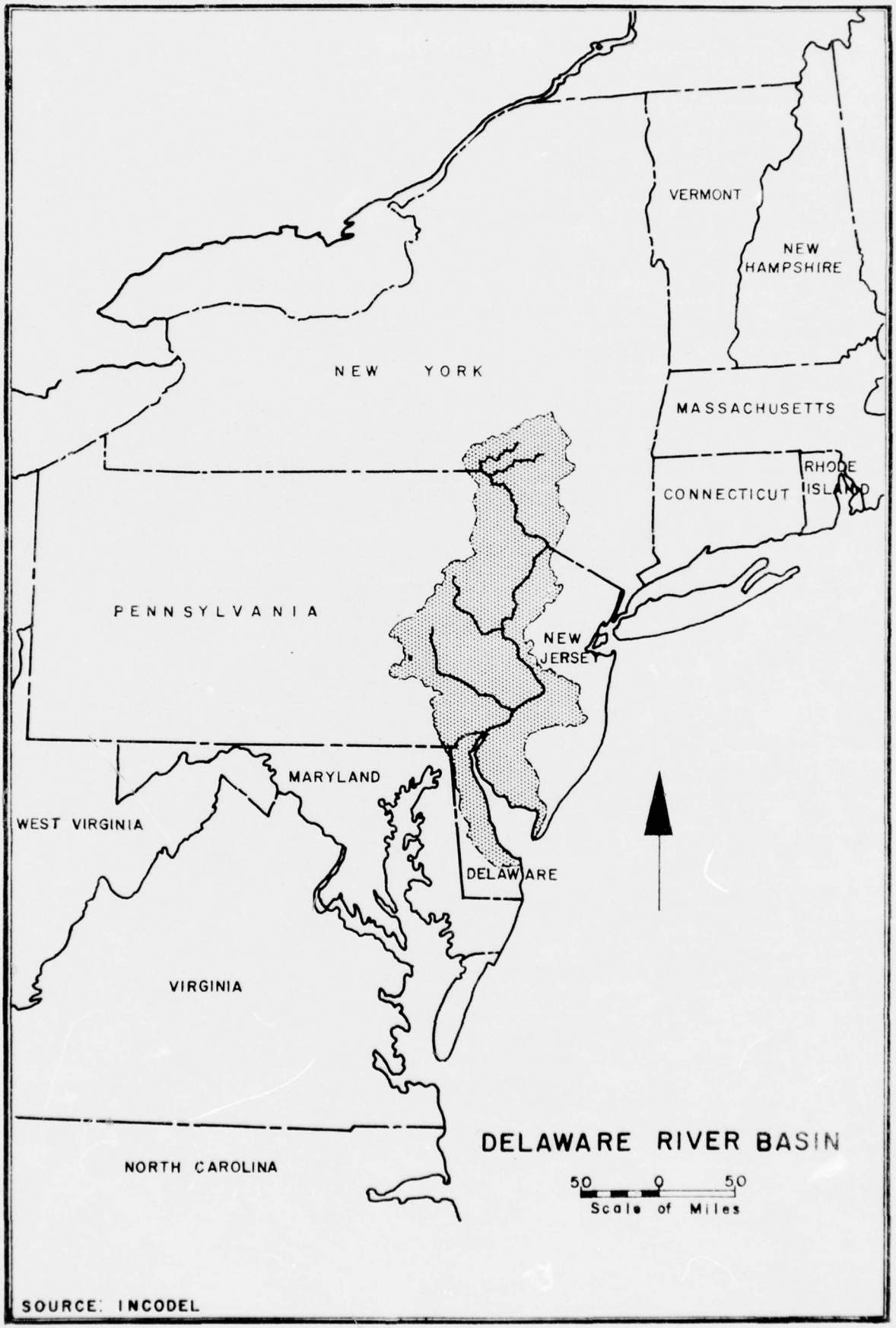

VERMONT
NEW HAMPSHIRE
NEW YORK
MASSACHUSETTS
RHODE ISLAND
CONNECTICUT
PENNSYLVANIA
NEW JERSEY
MARYLAND
WEST VIRGINIA
DELAWARE
VIRGINIA
NORTH CAROLINA
DELAWARE RIVER BASIN
50 0 50
Scale of Miles
SOURCE: INCODEL

PLATE 1

16. Between the Delaware Water Gap and the mouth of the Lehigh River at Easton, the Delaware River drains a lower area characterized by rolling hills. Between Easton and Trenton, the river channel first cuts through irregular ridges and hills of granite, then cuts a deep valley between cliffs of red sandstone. At Lambertville, New Jersey, it crosses a range of hills of trap rock. At Trenton Falls, the river crosses the fall line and most of that section of the Basin below the fall line is characterized by flat topography.(1)

17. The Basin has a total area of 12,765 square miles, distributed as follows:

New York	2,362
New Jersey	2,969
Pennsylvania	6,422
Delaware	1,004
Maryland	8
Total.....	12,765

18. Although the New Jersey and Delaware coastal areas are not within the watershed of the Delaware River, these regions are included within the study area because of their great significance in relation to the recreation habits of the Basin population. These areas are hereafter referred to as "the included study area". It is recognized that other regions such as Chesapeake Bay, Maryland, Central Pennsylvania, and surrounding States also exert influences upon the recreation habits of the Basin population, yet to a much less degree than the coastal areas. It is also recognized that the New York Metropolitan Area exerts certain pressures upon the recreation resources and facilities of the Basin and these pressures will necessarily have to be taken into consideration; however, the greater New York area cannot be considered in detail as a part of the over-all study area.

PHYSIOGRAPHY

TOPOGRAPHY

19. The Delaware River Basin lies within five of the principal physiographic provinces of the Eastern United States: (a) Appalachian Plateau, (b) Appalachian Folds or Valley and Ridge Province, (c)Taconic Deformation Belt, (d) Atlantic Highlands, and (e) Atlantic Coastal Plain (2) Without exception, these physiographic provinces occur as parallel bands extending in a northeast-southwest direction and are generally parallel to the flow of the Delaware River between Port Jervis and Delaware Water Gap.

20. For purposes of this report, the Basin has been divided into the following physiographic regions: (a) Appalachian Mountains, (b) Piedmont Plateau, and (c) Coastal Plain. The Appalachian Mountains occupy the northern portion of the Basin and include the Kittatinny Mountains of New Jersey and Blue Mountains in Pennsylvania. The Piedmont Plateau constitutes the middle northeast-southwest section between the fall line

and the above mountain ranges, and the Coastal Plain is that portion of the Basin below the fall line.

21. The Catskill Mountains of New York and the Pocono Mountains of Pennsylvania, separated by the valley of the Delaware River, are the characteristic features of the Appalachian Mountains in the Basin. The Catskills are typically rugged and mountainous and reach their greatest elevation of 4,205 feet in Slide Mountains. The Poconos, to the southwest, constitute a rolling plateau with elevations ranging from 1,100 to 2,000 feet. The highest peak is Camelback Mountain (Big Pocono) with an elevation of 2,130 feet. The Kittatinny and Blue Mountains form a chain extending from Southeastern New York across the northwestern corner of New Jersey, cutting off the southeastern corner of Pennsylvania, and continuing in a southeasterly direction into the Blue Ridge. This mountain chain separates the mountainous region of the Basin and the rolling Piedmont Plateau. The Delaware Water Gap, where the Delaware River pierces this range, is a prominent physical feature. Elevations in this mountain chain vary from 1,000 feet to 1,803 feet at High Point in New Jersey.

22. The last Great Glacier covered the greater part of this region as evidenced by the physical remains. Most of the valleys received heavy deposits of debris during the glacial period and subsequent erosion has removed only a portion of this material.(2) Virtually the whole of the Pocono Plateau is covered with a layer of unconsolidated sand, gravel and rounded boulders. Moraines, kettleholes, kames, lakes, and ponds are characteristic of the region. Glaciated lakes are found in the southern Catskill area and throughout the Poconos.

23. This mountainous portion of the Basin is generally well forested with mixed hardwood stands and scattered evergreens. The general quality of the timber in the Catskills is considerably better than in the Poconos, where extensive areas of scrub oak and birch are found.

24. The Piedmont Plateau occupies the central portion of the Basin between the Kittatinny-Blue Mountain Range and the fall line, which occurs just above Trenton, Philadelphia, and Wilmington. Generally, this region is an undulating plain interrupted by ridges of trap rock. Elevations range from 50 feet to 1,000 feet in the higher hills and New Jersey Highlands.

25. Glacial till covers much of this region in New Jersey and glacial moraines are readily identifiable. Evidence of glaciation is not particularly noticeable in the Pennsylvania portion of the Piedmont region. Glaciated lakes dot the landscape in this province of New Jersey but are conspicuously absent in Pennsylvania.

26. The valleys and plains of this region have been cultivated since colonial times and now agricultural activities connected with dairying and grazing predominate. The hills remain wooded, primarily with mixed hardwoods.

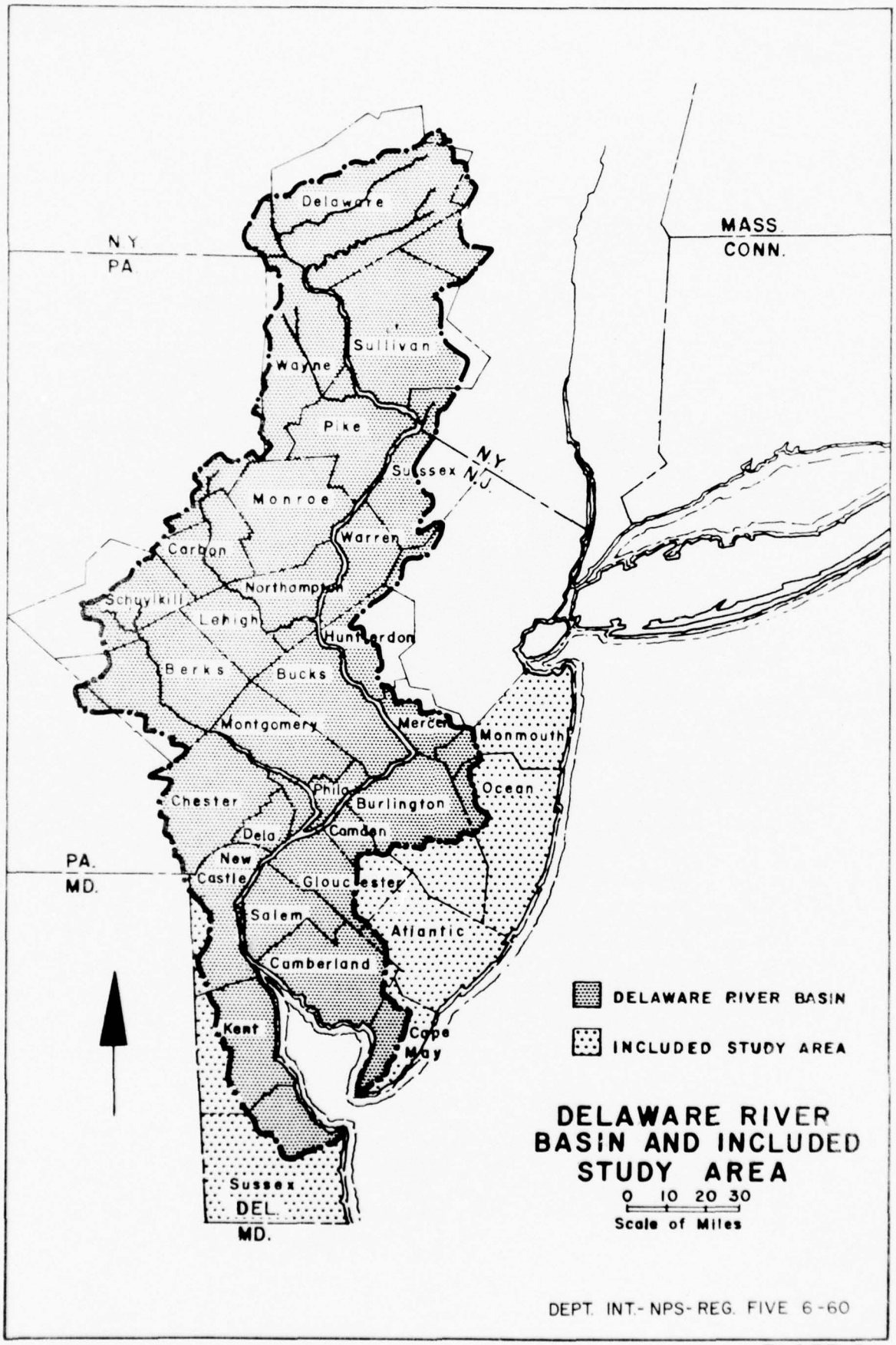

Delaware
N.Y.
PA.
MASS.
CONN.
Sullivan
Wayne
Pike
Sussex
N.J.
N.Y.
Monroe
Warren
Carbon
Northampton
Schuylkill
Lehigh
Hunterdon
Berks
Bucks
Montgomery
Mercer
Monmouth
Ocean
Chester
Philo.
Burlington
Dela.
Camden
PA.
MD.
New Castle
Gloucester
Salem
Atlantic
Cumberland
Kent
Cape May
Sussex
DEL.
MD.
DELAWARE RIVER BASIN
INCLUDED STUDY AREA
DELAWARE RIVER BASIN AND INCLUDED STUDY AREA
0 10 20 30
Scale of Miles
DEPT. INT.- NPS- REG. FIVE 6-60

PLATE 2

27. The fall line extends southwesterly from New York City to Trenton, Philadelphia, and Wilmington and separates the Piedmont Plateau from the Coastal Plain. Here the topography descends from an elevation of approximately 50 feet to sea level. The Coastal Plain occupies all of Southern New Jersey and all of Delaware except the northern-most fringe of the State. The surface of this region is gently rolling at the inner margin and flattens toward the sea. The soil is typically loose, sandy, unconsolidated morainic debris transported by streams from the higher hinterland.

28. Only fragmentary remnants of the forests that once covered the Coastal Plain remains today. There are extensive areas of scrub pine in the "Pine Barrens" of Southern New Jersey and better stands in the south central portion of the State. On the Delaware Coastal Plain, forests have virtually disappeared to make room for agriculture. Forest cover exists along stream courses and around the many ponds to be found throughout the State.

CLIMATE

29. The climate of the Delaware River Basin (3) is variable from the predominantly cold winters and cool summers of the Catskill Mountains of New York to the usually mild winters and moderate summers of Delaware and Southern New Jersey. However, the constant shifting of day-to-day weather patterns may bring warm winter rains into the upper part of the Basin and heavy snows, with zero weather, into the lower portions.

30. The ridge of hills featured by the Delaware Water Gap appears to be the natural dividing line between the cold continental influences from the north and west, and the milder maritime influences from the south and east. Heavy snows produced by continental lows traveling eastward near the St. Lawrence Valley may bury the upper portion of the Basin while the southern or lower portion will receive no snow and only a moderate temperature fall. Yet it is not uncommon for a late winter or early spring coastal storm to bring a crippling snowfall to the lower portion of the Basin, while the upper portion escapes entirely.

31. Summer climate is cool to moderately warm, with uncomfortably hot and humid weather, generally short-lived and mostly confined to the urban areas of the lower river. The mountainous and upland areas are blessed with pleasantly warm summer temperatures almost without exception, making them ideal vacation areas.

32. In the northern portion of the Basin, the mean January temperature is 25 degrees F. and the mean July temperature is 70 degrees F.; however, in the Catskill Mountains of New York the mean temperatures for these same periods are 20 and 66 degrees, respectively. An average of 40 inches of uniformly distributed precipitation falls annually. Forty-five inches of snow normally blankets the region each year; however, in the higher Catskills, the annual average is 60 inches.

33. The southern portion is somewhat more moderate, with an average

January temperature of 33 degrees F. and an average July temperature of 76 degrees F. Rainfall averages 42 inches annually, with a remarkably uniform distribution throughout the year.

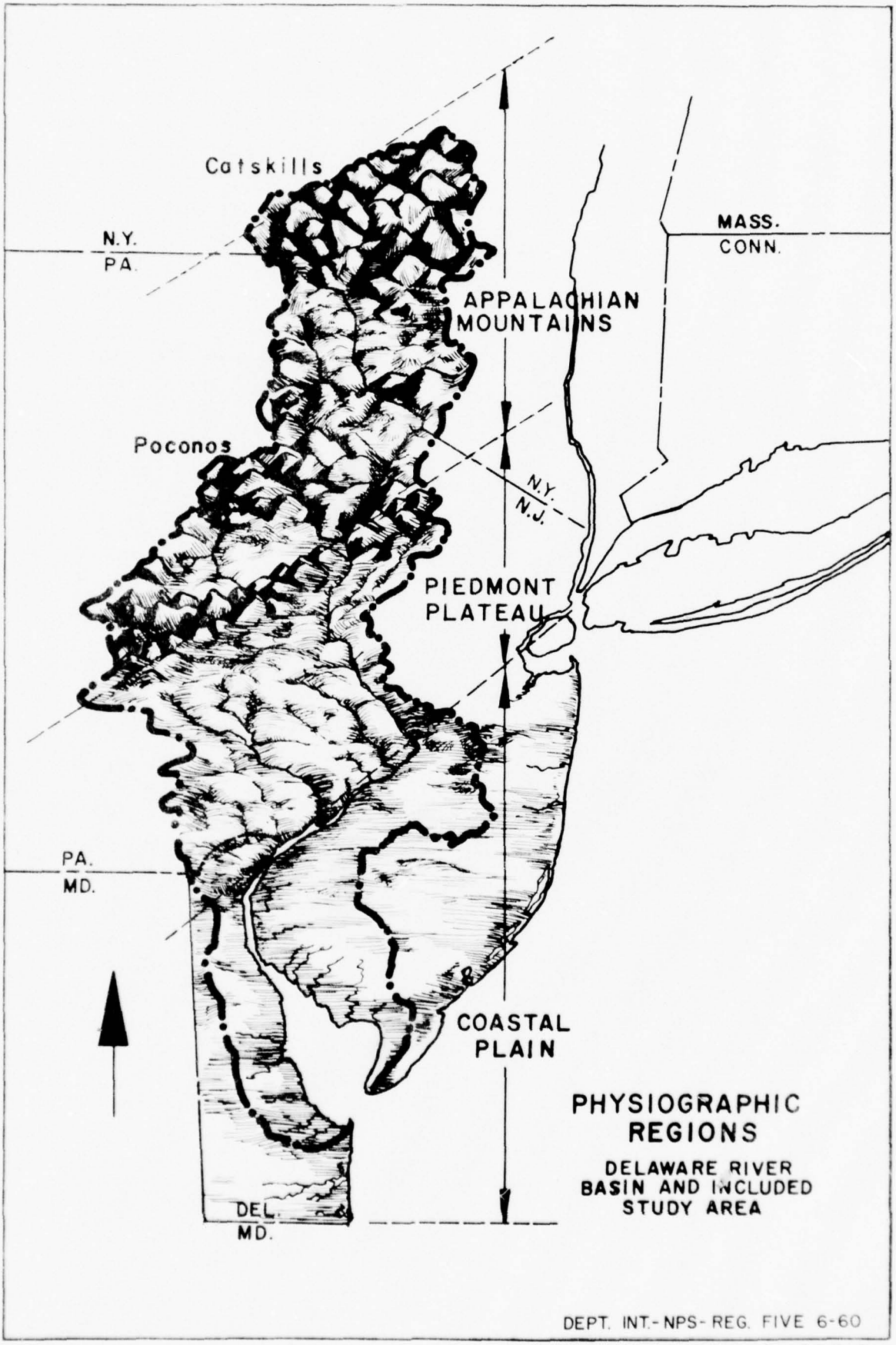

Catskills
N.Y.
PA.
MASS.
CONN.
APPALACHIAN
MOUNTAINS
Poconos
N.Y.
N.J.
PIEDMONT
PLATEAU
PA.
MD.
COASTAL
PLAIN
DEL.
MD.
PHYSIOGRAPHIC
REGIONS
DELAWARE RIVER
BASIN AND INCLUDED
STUDY AREA
DEPT. INT.-NPS-REG. FIVE 6-60

PLATE 3

II - HISTORICAL BACKGROUND

THE INDIAN STORY

34. The American Indians, as introduced to the world by European explorers, were products of a long, complex, and vaguely understood process of racial and cultural development. Present conservative theory cites the Bering Sea area of Alaska as the major place of entry for the first permanent inhabitants of this hemisphere. The movements of these small, nomadic, Paleo-Indian groups - hunters, fishers, and gatherers - were dictated by climate, game, and necessity. This was not a purposeful, organized migration. Centuries later, at the time of contact with white men, the Indian population had evolved into a large series of ethnic groups of different linquistic stocks, physical appearance, and cultural patterns.

35. The archaeologist knows that the Paleo-Indians were spreading throughout North America during the terminal stages of the Pleistocene period. When they first inhabited the Delaware River Basin is problematical. The physical characteristics of these earliest people are unknown, as is their language. Artifacts have been found in the Basin similar to the Paleo-Indian types of the Western United States.

36. Present evidence indicates seven major continuous cultural periods from the earliest archaeological horizons into historic times. Although the dates and duration of these periods may vary within the Basin, an accepted chronology is as follows:

Paleo-Indian	?
Early Archaic	Pre-500 B.C.
Late Archaic	500 B.C. - 500 A.D.
Early Woodland	500 A.D - 900 A.D.
Middle Woodland	900 A.D - 1200 A.D
Late Woodland	1200 A.D - 1600 A.D
Historic	1600 A.D. -

37. Until the early Woodland Period, by which time the introduction of agriculture is certain, the Indian groups were hunters, fishers, and gatherers. Agriculture - primarily maize (corn), beans, squash, pumpkins, inaugurated a basic shift in the subsistence pattern. As a sedentary village life developed, other changes in the cultural pattern also took place. A more complex sexual division of labor, new subsistence techniques and tools, and agriculturally-associated religious rites also developed. By historic times the Indians were far from aimless wanderers. The Iroquois Confederacy, although north of the Delaware River Basin in New York State, was a sophisticated, powerful political force. They exerted influence over the whole basin, and particularly, by right of conquest, over the Delaware or Lenni-Lenape tribes of Pennsylvania, New Jersey, and Delaware.

38. The European Indian contacts, as recorded by history, stamped

indelibly all future relations of both sides. Some examples are the problem of European expansion, trade, and political balance of power; the concepts of religious freedom as demonstrated by the Moravian Missionaries; the Indian practice of personal use, without impairment of tribal lands - usufruct - as contrasted to the English system of individual property ownership; the formulation of agreements, e.g., Penn's Treaty and the Walking Purchase, and the respect each side accorded such agreements; the establishment of one of the first Indian reservations at Okehocking in Chester County, Pennsylvania, and the many changes in military tactics and equipment.

39. The effect of these inter-cultural influences played a certain but as yet somewhat unknown role in the molding of the dominating, independent spirit of the American colonists, as well as in the distrustful, angered, and often defeatist attitude of the Indians.

EXPLORATION AND SETTLEMENTS

40. It is difficult to separate the early histories of New Jersey, Delaware, and Pennsylvania. At one time or another during the seventeenth century, Dutch, Swedish or English flags flew over parts of these States and settlements were established by all three nations.

41. The recorded history of the white man in the Delaware region begins in 1609, just 2 years after the founding of the first permanent English settlement at Jamestown, Virginia. In April of that year, Henry Hudson sailed from Amsterdam under the Dutch flag, and failing to locate a northern route to Asia, abandoned his search and sailed southward. Skirting the coast, he encountered a large body of water that was eventually named Delaware Bay by the English.

42. The first settlement by a European country in the Delaware Valley was made in 1623 by the Dutch West India Company. The Dutch were followed by the Swedes who established a colony at Fort Christina (Wilmington) in 1638. These settlements lived in an uneasy state of truce until 1655 when the Dutch, no longer needing Swedish aid in the European conflicts of that period, forced the surrender of the Swedish settlements in the Basin. New Sweden was dead but the tight warm log cabin remained as Sweden's contribution to early American architecture.(14)

43. Meanwhile, the English, with the Puritan Commonwealth (Ca. 1642-1660) out of the way, were taking a new energetic interest in New World expansion. James, Duke of York was appointed Lord High Admiral of the Royal Navy by his brother Charles II of England. As head of the navy he wished to deprive the Dutch of their base at New Amsterdam and at the same time to acquire a profitable colony for his own use.

44. James received a large territorial grant embracing the land from the Connecticut River to the Delaware River. In 1664, a small English fleet entered New York harbor and obtained the surrender of New Netherland without firing a shot. When Fort Casimir (New Castle)

was captured in October, the Delaware Valley was included in the British possession of a section of America that was destined to become the wealthiest area in the world.

45. Convinced that the territory granted to him by Charles II was more than he could properly manage, James began to break up his domain as early as 1664. To his friends Sir George Carteret and Lord Berkeley he granted the land (New Jersey) lying between the Hudson and Delaware Rivers. Berkeley retained his share only ten years and then sold it to John Fenwick acting for a fellow Quaker, Edward Byllinge. This marks the entrance of the Quakers in the Delaware River Basin. In 1676 Carteret consented to the division of New Jersey into two conponents - East New Jersey which he retained, and West New Jersey which was the property of the Byllinge interest. Byllinge and Fenwick developed a difference of opinion over their holdings and referred their dispute to William Penn for a decision. Penn saw for the first time a practical way of establishing a refuge for the persecuted of England and the Continent. This, in a sense, was the genesis of the "Holy Experiment" that became Pennsylvania, although Burlington, New Jersey had been founded (1677) and some 1,400 Quakers were in the New World before Penn acquired his charter for Pennsylvania.

46. Of all the Englishmen interested in the colonization of America, none was so successful as William Penn. Born in 1644, the son of the famous and wealthy Admiral William Penn, the younger Penn became a Quaker when he was 23 years old. This sect was a small despised religious group that suffered many years of persecution for their religious beliefs before they were grudgingly tolerated. The Admiral was most unhappy about his son's conversion, but this did not alter William's convictions.

47. Penn's conversion to Quakerism never caused him to break with his father's friends at court. Charles II owed Admiral Penn a sum of 16,000 pounds at the time of the latter's death. A tactful reminder led the King to repay the debt by bestowing upon Penn a large tract of land that was named Pennsylvania. In addition to this tract, Penn obtained the land known as Delaware or the "Three Lower Counties" for his use. Penn's dream was fulfilled and he was free to construct a government and social system where man could live in peace, brotherly love, toleration, sobriety, and charity. His ideals, particularly those of religious freedom, entered the mainstream of American thought.(5)

48. When Penn came to his new home in 1682 he found, of course, the shores of the Delaware occupied by the Swedes, Dutch, and Finns. These people were given land grants and extended a freedom of living according to the ideals of the founder of the colony. Philadelphia was laid out between the Delaware and Schuylkill Rivers in the checkerboard fashion that has left a permanent mark upon American city planning.(6)

49. Pennsylvania prospered as no other English colony did. Founded at a time when economic conditions were good and when political

restrictions in England and religious persecution on the continent made thousands of good people eager to seek peace, liberty, and prosperity overseas, the province attracted both labor and capital. When the colony was only 3 years old, its population was just short of 9,000. Germans of the Mennonite sect (linen weavers by trade) had settled in Germantown; the Welsh Quakers had founded Radnor and Haverford; and the English Quakers had started fisheries, established brick and glass works and tanneries. Little wonder these thrifty, hard working people were successful in their new homes.

50. Pennsylvania was a harbinger of the America that was to be. It was the first large community in modern history where different races and religions lived under the same government in terms of equality. The liberals of Europe looked upon Pennsylvania as a successful experiment where man could lead a good life without monarchy, feudalism, or religious and racial uniformity.(5) Penn planted the seed that became the great tree of American Independence and democracy.

51. One of the last acts of Penn as resident governor was to consent to a division of his province. In the first political assembly held in Pennsylvania, Delaware membership was equal to that of the Pennsylvania section. But from the beginning, the people of the "Three Lower Counties" showed a spirit of dissension and unrest. By a provision in Penn's "Charter of Privileges" these three counties were permitted to withdraw and create a separate colony, organize their own legislature, but retain the Governor of Pennsylvania, subject to the authority of the proprietor. The break was accomplished in 1704, and out of the proprietary domain of William Penn came two of the original thirteen colonies.

52. Penn was continually involved in boundary disputes with his neighbors. It was more than 80 years before the several points at issue were resolved.

53. First, the Maryland-Pennsylvania boundary was established through a chancery-ordered survey from which evolved the Mason-Dixon Line. Maryland then recognized the right of Penn to Delaware and, to determine the Maryland-Delaware Boundary, a line was extended in a westerly direction from Fenwick's Island in the Atlantic to a point half way to Chesapeake Bay. From this terminus, another line was laid in a northerly direction to the Mason-Dixon Line. The northern boundary between Delaware and Pennsylvania was determined by striking an arc on a 12-mile radius from the spire of the State House at New Castle, touching the Mason-Dixon Line on the west and the Delaware River on the east.(7)

54. Meanwhile Delaware's neighbor across the river underwent a change of government. In 1702, New Jersey became a united royal colony under the Governor of New York.

55. Despite the merging of the two Jersey, separate capitals were maintained at Perth Amboy and Burlington until after the American Revolution, with the legislators meeting alternately in the two capitals. The

proprietors relinquished only civil authority when the Crown took over. This proprietary control, absentee government, and trouble with the Governor of New York finally resulted in a separate governor being appointed for New Jersey in 1738.

COLONIAL DEVELOPMENT

56. The population of the twelve English seaboard colonies in 1713 was nearly 360,000. By 1760, and with the addition of Georgia, it has climbed to 1,600,000 with the Delaware Valley growing proportionately with the other areas. Much of the increase in the Basin (as in the other colonies) was due to large families; perhaps much more was due to the immigration of Germans and Scotch-Irish from Europe. During the course of the eighteenth century, thousands of Germans from the Palatine, the Upper Rhine and Switzerland, and Scotch-Irish from Ulster (North Ireland) poured into Pennsylvania through Philadelphia. The natural advantages of climate and soil, religious toleration, and an enlightened form of government made Pennsylvania a natural haven for the discontented of Europe.

57. The Germans were a thrifty people who took up the best farm land of the Delaware, Lehigh, and Schuylkill Valleys, and became the most successful and prosperous farmers in the colonies. Pressure by the native Catholic Irish and legislation by the British Parliament forced the Scotch-Irish to emigrate. Many of these entered the colonies through Philadelphia. Finding the best lands in the east occupied, they moved on to the frontier where land was cheap.

58. The upper reaches of the Basin were settled by small numbers of Scotch-Irish, Germans and New Englanders the latter particularly from Connecticut. These frontier people formed the outer defenses of the colonies against the Indians during the eighteenth century. Actually, the threat of French and Indian raids and Indian displeasure at every effort to appropriate more land prevented expansion northward and westward in New York.

59. The Moravian missionary activity of 1740-60 represents a positive approach to the Indian problem. The Moravians came to Pennsylvania in 1740, where they founded Bethlehem and Nazareth. Working in the frontier country just beyond the Kittatinny Range and Blue Mountain, the impact of these people on the Indians was so great that the Delaware Indians of the area became known as "Moravians" Indians. The Moravians were a devoted and energetic people, deeply concerned in missionary work, especially among the Indians for whose welfare they worked more zealously and effectively than any other Protestant group in Colonial America.(8)

60. Industry and commerce flourished in the Delaware Valley as in the colonies generally during the eighteenth century, although agriculture remained the chief occupation of the majority of people. The British Isles and Continental Europe were interested in colonial agricultural and "natural" products and this made for prosperity in the colonies.

Philadelphia became the principal place of export for grains and provisions. Rules and regulations promulgated by the English Parliament were generally ignored. If they had been heeded, the number of iron mills and forges certainly would not have multiplied as they did in the Delaware Basin where the iron industry developed and prospered. By 1760 there was a thriving colonial iron industry wherever ore, wood, and water power were found, as exemplified by the number of furnaces found in Berks County, Pennsylvania. Shipbuilding, lumbering, textiles, paper-making, pottery, and leather goods round out the industrial contributions of the Basin area.

IMPERIAL STRUGGLE

61. On a September afternoon in 1759, a detachment of English artillery and infantry marched into Quebec, the Capital of New France. The flag of Great Britain flying above the plains of Abraham signalled the end of the French dream of empire in the New World.

62. The American colonial wars were reflections of the series of conflicts which swept over Europe in the eighteenth century. However, the control of North America was, in itself, an important factor in the broader struggle for imperial supremacy between England and France. Meanwhile, frontier wars in North America represented a rivalry which had local origins equally as compelling as the dynastic ambitions of European rulers.

63. As early as 1613, the English had reacted to the French threat in North America by wiping out the feeble colonies at St. Croix and Port Royal. The French success in crushing the Iroquois in 1666 had not been followed up by positive action. This success had given the French their opportunity to dominate the English by moving into the Hudson Valley and encircling New England, but they had vacillated too long. England seized the initiative by capturing the Dutch settlements on the Hudson and securing the Iroquois fur trade. However, it was not until the end of the seventeenth century that the first of the major frontier wars broke out.(9) From King William's War, 1689-1697, until the fall of New France, villages along the frontier lived in constant fear of sudden attack by Indian warriors and their French leaders.

64. By the mid-eighteenth century the final conflict was at hand. This began in the wilderness of Western Pennsylvania when Virginia militia under Lt. Col. George Washington clashed with French forces. From these almost casual beginnings stemmed what had been called the French and Indian War, which saw the triumph of England over her old rival, France, in both the Old World and the New. With the fall of Quebec in 1759, and the surrender of Montreal a year later, New France was no more. The Treaty of Paris closed the long conflict and its results were far reaching. It marked the end of the French empire on the North American Continent. It freed the thirteen colonies from the menace of the French; opened the way for movement to the west; and helped to set the stage for the American Revolution.(10)

65. In the French inspired "time of troubles" (1755-58) the northern and western frontiers were subject to Indian raids. Forts were constructed - or stone houses were turned into forts - in New York (Forts Becker and Westbrook), New Jersey (Forts Westbrook and Normanock), and Pennsylvania (Forts Matamoras, Hyndshaw, Hamilton, and Norris). None of the forts figured in important actions and yet, by affording permanent places of "retreat" for the provincial militia, they were important in maintaining English settlements on the Frontier.(8)

REVOLUTIONARY PERIOD

66. To tell the story of the Delaware Valley during the trying times of the American Revolution is to recite a rather complete history of the struggle. The valley was a center of resistance, of defense, and opposition to royal tyranny. Here independence was proclaimed in the State House now known as Independence Hall; here the news of liberty was first heard; here statesmen gathered to conduct a war and to man the ship of state in the Continental Congress; here a new nation was created and a Constitution was drawn up; and here, later was the Capital of the United States.

67. Great Britain emerged from the French and Indian war with a greatly enlarged domain in the New World. The English sovereign was convinced that the entire colonial system must be put on a more systematic basis. This led to various proclamations and laws that materially affected the lives of the colonists in the Delaware Basin, as elsewhere. Inevitably, a spirit of resistance was engendered. First, there was the clash of economic interests. The Acts of Parliament that attempted to regulate colonial commerce, navigation, manufacturing, and finances were in some ways advantageous to the colonists. More often there was disadvantage, especially in terms of upsetting extra-legal patterns of trade that had become established under the previous period of salutary neglect. The disadvantages were still often overcome by circumventing the law. Nonetheless the whole period showed a definite trend towards subordination of colony for the benefit of the mother country. Secondly, the colonial legislatures wished to maintain and increase their power to the detriment of British colonial officials and their associates. Basically, there was a lack of understanding between the colonies and homeland. The problems of the settlers in their new homes were not the same as those found in England. It must be remembered too, that all settlers were not Englishmen. Friction on religious grounds had always existed. Now it was intensified in terms of the Proclamation line establishing a policy of toleration for French Papists across the Appalachians. Religious dissenters do not submit tamely to political tyranny. Thus, political, economic, and social forces were driving the antagonists apart.

68. As opposition toward England's colonial policy developed, Philadelphia, the principal city of the English colonies in America, became the center of resistance. In Carpenters' Hall, the First Continental Congress met in September 1774 to protest Britain's policies in regard to the American colonies. In May 1775, the Second Continental Congress met in the Pennsylvania State House and decided to move from

protest to resistance. Warfare had already begun in Massachusetts when the Congress chose George Washington to be the Commander-in-Chief of the Army. While Washington organized the army, the Congress organized the Revolutionary Government. On July 4, 1776, the Declaration of Independence was adopted by the Congress in Independence Hall. It is one of the world's most significant statements of democratic principles and human rights in history, and remains today as the basis of the free government of the United States. In 1789, the first Constitution of the new government was adopted to replace the Articles of Confederation.

69. Following the Declaration of Independence, came the long hard years of war. The revolution was actually a succession of three theaters of operation. First was New England, followed by campaigns in the Middle Colonies, and finally in the South, and the "climax of the Revolution" at Yorktown, Virginia. New Jersey and Pennsylvania witnessed some of the fiercest fighting of the war. Perhaps the darkest hour was immediately after the Battles of Long Island and White Plains, when Washington began his retreat across New Jersey after Fort Lee fell on November 19, 1776. A new ray of hope penetrated the darkness when Washington abruptly abandoned his retreat into Pennsylvania, crossed the Delaware River on Christmas night, and successfully attacked the Hession garrison at Trenton. Washington recrossed the Delaware, remained there a few days, and suddenly was back on Jersey soil. Successfully evading Lord Cornwallis, who had been sent to harrass him, he routed three British regiments at Princeton and retired to the highlands of New Jersey above Morristown. Within a few days, despair had turned to hope.

70. Throughout the spring and early summer of 1777, Washington and Sir William Howe played "cat and mouse" throughout Central New Jersey. In June, Howe sailed from New York for Chesapeake Bay. Landing at Head-of-Elk on August 25, he marched overland and after defeating Washington's army at the Battle of Brandywine, occupied Philadelphia. Congress fled the city and moved from town to town, depending upon the direction the British moved. Howe occupied the capital city and the army encamped at Germantown. In the meantime, Washington had moved his forces close to Philadelphia and decided to attack Howe's encampment. The battle was joined but every attempt to bring victory was frustrated by the British, and the Americans were fortunate to extricate themselves. Following this near disaster, Washington and his men went into winter quarters at Valley Forge - the popular symbol of privation and suffering in the Revolutionary War - during the winter of 1777-1778.

71. In the summer of 1778, Sir Henry Clinton, the new British Commander who had replaced Howe, withdrew the army from Philadelphia to establish his headquarters in New York. Washington pursued Clinton's force until battle was joined at Monmouth and ended in a stalemate. This was the last major encounter in the Basin area. New Jersey was not subjected to the sound of musketry and cannon fire for the remainder of the war. Save for frontier warfare, the struggle for independence moved to the southern colonies.



First home of John James Audubon in America preserved by the Montgomery County Pennsylvania Park Commission.



Where Washington crossed the Delaware River, Christmas night 1776, on the eve of the Battle of Trenton, Washington Crossing State Park, Pennsylvania.

72. On the frontier, Indian depredations forced Washington to take positive action to curb the Indian menace. Men were assembled at Easton, Pennsylvania in the early summer of 1779 under the command of General John Sullivan. Prompted by the "Wyoming Massacre" of the previous year, this expedition by a victory at Newtown (Elmira), New York practically eliminated the threat of the Indian-Tory menace and secured the Pennsylvania-New York frontier.(7) The settlers felt safe to return home.

73. The Treaty of Paris, in 1783, recognized the independence of the former British colonies. The musket and sword were put aside and the ablest men of the new nation prepared themselves for the tremendous task of molding these thirteen separate political units into one body to take its place in the family nations.

NATIONAL DEVELOPMENT

74. Equal in size to the combined area of the British Isles, Germany, Italy, France and Spain, the new United States was like a child growing into adolescence. The Delaware Basin reflected this growth pattern. Politically the American "youngster" was attempting three experiments simultaneously: independence, republicanism, and federal union. Socially and economically, the new nation was struggling to adapt its way to the challenge created by its birth. The political instrument of growth was the Constitution, adopted 1789, when the country's economic condition brought dissatisfaction with the Articles of Confederation.

75. The Delawarean, like other Americans, wanted to feel that he was independent. He cleared the land, built his home, planted and harvested his crops, hunted, and fished. Yet try as he might to be independent it was necessary to call upon his neighbor in time of harvest, sickness, barn or house raising. Life was rural in nature. In 1790, there were only six cities in the country with a population of 8,000 or more. One of these was Philadelphia.

76. Except for iron, notably in the Delaware Valley, the vast natural resources of the new nation were relatively untouched. Agriculture was the occupation of ninety percent of the people. Here, more often than not, as the land became worn out and unproductive the settler merely pulled up stakes and moved to new ground.

77. Manufacturing was generally on a small scale, carried on by hand in the home or small shop. Notable men of that period were Oliver Evans, the Isaac Watt of America, and America's first great engineer; William Bradford and William Rittenhouse, who established the first paper mill in America at Germantown; and John Fitch who was the first to operate a steamboat successfully in 1785. Then the great Industrial Revolution began. The Napoleonic Wars in Europe and the War of 1812 served as an impetus to spur the demand for American self-sufficiency and by the close of the war the factory system was well established.(11)

78. From these humble beginnings, the Basin had grown into one of

the most highly industrialized centers of the world. From the infant industries of the colonial period, the Basin has expanded to produce steel products (Bethlehem Steel Company, United States Steel Company, John A. Roeblings Sons, Company), railroad equipment (Budd Company), chemicals (E.I. Du Pont De Nemours Company), ships (New York Shipbuilding Corporation, Sun Shipbuilding and Dry Dock Company), pottery (Lenox, Inc.), textiles, rubber and leather goods and hundreds of other items.

79. The bulk of the active mineral productions of the Basin early became centered in the anthracite coal fields in Schuylkill and Carbon Counties and in the Allentown-Bethlehem-Easton area. This latter segment of the Basin (in Pennsylvania) also produces cement. The production of slate, crushed stone, and building stone is an extensive and important operation in the Basin.

80. From the primitive Indian trail there emerged a system of modern highways and railroads that would have astonished the natives of the New World if they had returned. Colonists found it necessary to travel from place to place by wagon or horseback over very poor roads. Much of this was rectified during the first half of the nineteenth century with the emergence of the canal era and the advent of the railroad. The "Stourbridge Line" began its trial run at Honesdale, Pennsylvania, the first locomotive operated by steam on rails in the United States, 1829.

81. When New York, in 1817, began the construction of the Erie Canal to link Lake Erie with the Hudson River, this successful venture acted as a stimulus to prod the Basin people into action. The result was a combination canal and railroad from Philadelphia to Pittsburgh, the original "Main Line". One of the numerous branches thereof was the Delaware Division, hauling coal in the main between Easton and Bristol. New Jersey joined the canal movement by constructing the Delaware and Raritan Canal between New Brunswick and Bordentown. Important and valuable as these improvements in transportation were, they did not serve to retain Philadelphia's commercial supremacy. The great city lost her commercial leadership and place as chief city in the East. The canals lost their position in transportation to the railroad and one of these, the Pennsylvania Railroad, became one of the greatest transportation systems of the world.

82. The results of the industrial revolution are difficult to summarize. However, certain conclusions are obvious. National wealth was enhanced, the standard of living was raised, urbanization was speeded up, immigration was prevalent and population increased rapidly. People of the Basin were influenced by all these factors.

83. Agriculture was and still is very much in evidence. Not all of the land was turned into town and city lots as food was required to feed the urban dwellers. Southern Delaware, Southern New Jersey, and Pennsylvania farm lands continue to produce fine food stuffs. This is exemplified by New Jersey which truly became "the Garden State" as early

as 1900. During the twentieth century there has been a decline in the farm population and the Basin is predominately urban and industrial.

84. Twentieth century Delaware Valley may look back and view the tremendous progress made by the people occupying its soil. From a handful of Dutch and Swedish settlements in the early seventeenth century, the region has grown into a highly populated industrial center. Each facet of political, economic, social, and military history has its proper niche in telling the story of the Basin.

III - PEOPLE AND ECONOMY

POPULATION

85. Approximately four percent of the total population of the United States resides within the drainage area of the Delaware River, and the service area of the Basin includes an additional nine percent of the total continental population. The 1950 census indicated a total Basin and included study area population of 6,002,000 which had increased to 6,685,000 by 1955. Population projections for the years 1965, 1980, and 2010 are shown in Table 1 which indicates that the population of the Basin is expected to more than double by 2010, when a population of 14,100,000 will be reached.(12)

POPULATION

Delaware River Basin, 1950 and 1955
Projections for 1965, 1980 and 2010
(Thousands)

SUBREGION	1950	1955	PROJECTIONS 1965	1980	2010
Upper Basin Area*	458	449	650	750	950
Allentown-Bethlehem-Reading Metropolitan Area	736	798	900	1,100	1,550
Philadelphia Metropolitan Area	3,671	4,121	4,800	5,800	7,900
Trenton Metropolitan Area	230	250	300	400	650
Wilmington Metropolitan Area	268	329	450	600	1,000
Southern Basin and Coastal Area#	639	738	950	1,300	2,050
TOTAL	6,002	6,685	8,050	9,950	14,100

* Does not include Ulster County N.Y. (Population 102,000)
\# Includes Monmouth County, N.J. (Population 269,000)

TABLE 1

86. Although the Basin is well populated throughout its length and breadth, the great bulk of the residents are concentrated in the central metropolitan belt, which includes the Allentown-Bethlehem-Reading industrial section, and the Philadelphia, Trenton and Wilmington Metropolitan Areas. Approximately 82 percent of the Basin population is found in this great industrial belt. The remaining 18 percent is divided between the more sparsely settled upper Basin and the southern agricultural and coastal area. The Basin population is essentially urban in character.

87. The standard metropolitan area of Philadelphia covers five counties in Pennsylvania and three counties in New Jersey. The City of Philadelphia and Philadelphia County are one and the same. The City of Camden and the Counties of Burlington, Camden, and Gloucester, New Jersey, are integral parts of Greater Philadelphia. This metropolitan area alone accounts for nearly two-thirds of the Basin population, or 4,121,000 (1955).

ECONOMY

88. Since William Penn sailed up the Delaware in 1682, the Valley has been a center for industry and trade. In the post-World War II period, the region from Trenton to Wilmington has grown into a vast industrial complex and is one of the most diversified and productive areas in the world. More than 87 percent of the industries listed in the U.S. Census of Manufacturers are represented in the Valley.(13) Greatest industrial activity is centered around the Philadelphia, Camden, Trenton, and Wilmington metropolitan areas and in the Lehigh and Schuylkill River Valleys, noted for anthracite coal fields, and steel and cement industries.

89. Agriculture is largely confined to the area between Delaware Water Gap and Trenton, and the southern portion of the Basin where large quantities of truck crops and dairy and poultry products are produced for consumption in the population centers, for export from the Basin, and to supply raw materials for food processing plants.

90. The economic life of the Basin population is related directly to industrial prosperity. It is the plants, mills, and service industries of the Valley that provide the personal income for Basin residents. Farm income, once of prime importance in the economy of the Basin, accounted for only 1.7 percent of the total personal income during 1955. For the same year, total personal income for the Valley was $13,419,000,000. This represents a per capita income of $2,059. which is 11 percent above the per capita income for the Continental United States. By the year 2010, the average per capita income is expected to be approximately $5,000 per year.(12)

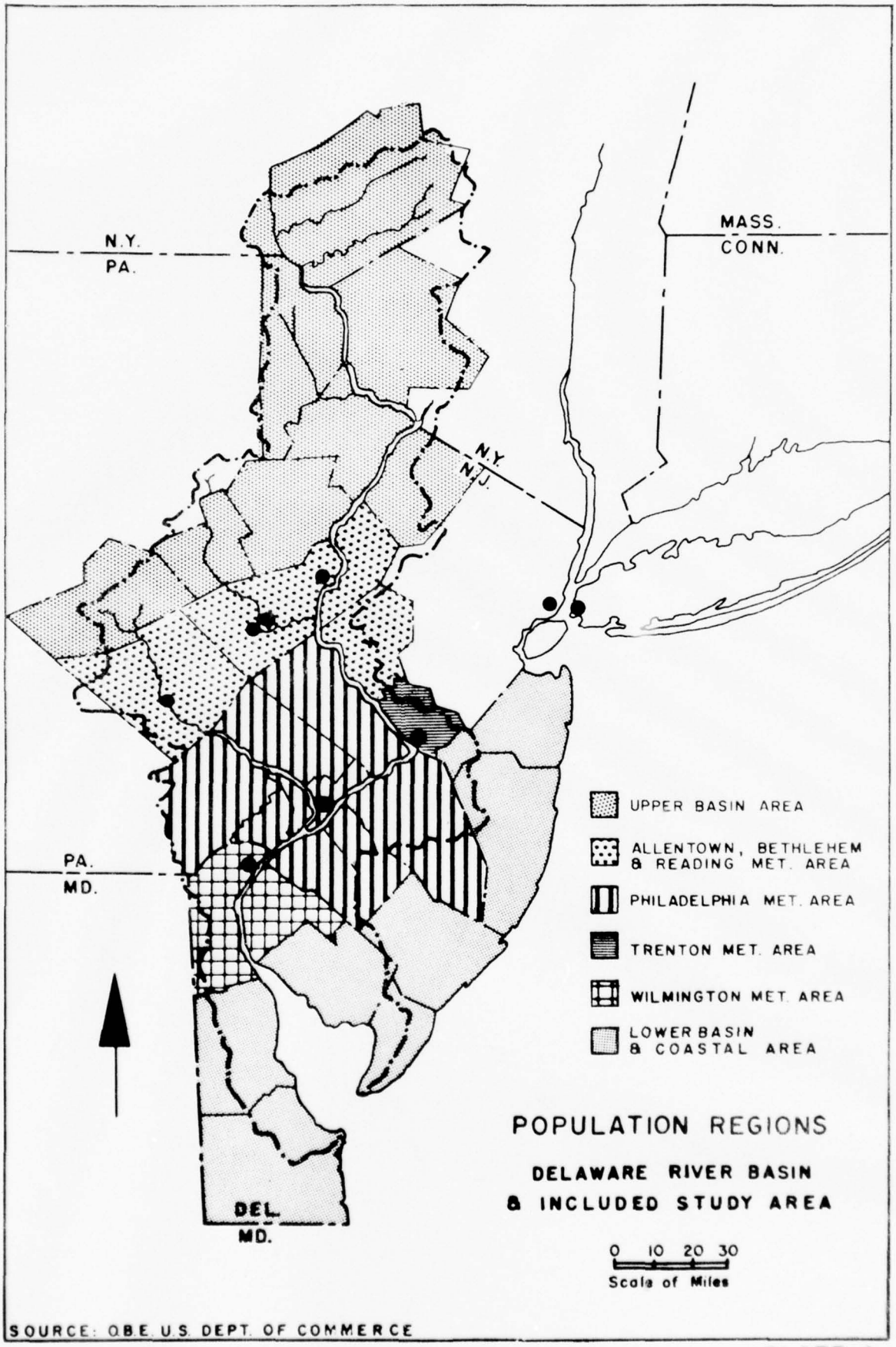

N.Y.
PA.
MASS.
CONN.
N.Y.
N.J.
PA.
MD.
DEL.
MD.
UPPER BASIN AREA
ALLENTOWN, BETHLEHEM & READING MET. AREA
PHILADELPHIA MET. AREA
TRENTON MET. AREA
WILMINGTON MET. AREA
LOWER BASIN & COASTAL AREA
POPULATION REGIONS
DELAWARE RIVER BASIN & INCLUDED STUDY AREA
0 10 20 30
Scale of Miles
SOURCE: OBE U.S. DEPT. OF COMMERCE

PLATE 4

PERSONAL INCOME IN DELAWARE RIVER BASIN, 1955

SUBREGION	(Millions of Dollars)				Per Capita Income (Dollars)
	Total Income	Farm Income	Non-Farm Income		
			Manufactur'g	Other	
Upper Basin Area	802	46	183	573	1,456
Allentown-Bethlehem-Reading Metropolitan Area	1,544	38	641	865	1,935
Philadelphia Metropolitan Area	8,793	74	2,676	6,043	2,134
Trenton Metropolitan Area	574	5	196	373	2,296
Wilmington Metropolitan Area	931	11	358	562	2,830
Southern Basin and Coastal Area	775	57	143	575	1,652
TOTAL INCOME	13,419	231	4,197	8,991	- -
Per Capita Income for Delaware River Basin					2,059

TABLE 2

(Per Capita Income ($2,059) is determined by dividing Total Income ($13,419,000,000) by the adjusted total population (6,518,000). Adjustment is required since the table includes income for Ulster County, N.Y. (population 102,000) in the Upper Basin Area and excludes income for Monmouth County, N.J. (population 269,000) in the Southern Basin and Coastal Area. Net adjustment to Total Population as shown in Table 1 is minus 167,000.)

91. These population and economic statistics and projections are significant factors in the recreation habits and patterns of the Basin population. It has long been recognized that the urban dweller who earns his livelihood in the mills, plants, and offices is the person who seeks relaxation in the nonurban areas. These people now have more leisure time, higher salaries, and paid vacation periods, all of which are conducive to spending more time in recreation pursuits. It is reasonable to assume that this trend will continue. In this highly industrialized region, where industry will in all probability become increasingly important as a source of personal income and where urbanization will continue to increase, it seems reasonable to assume that the percentage of the total Basin population seeking nonurban recreation will also increase as will the problem of providing nonurban recreation areas and facilities.

VACATION INDUSTRY IN THE BASIN ECONOMY

92. Wholly reliable figures pertaining to the value of recreation in the economy of the Basin are not available. However, reasonable estimates based upon recent studies conducted within the area and special reports from resort areas would place the gross annual receipts from resort recreation at approximately 500 million dollars. Of this amount, 300.5 millions can be attributed directly to vacation regions as indicated by Table 3, which does not reflect the tremendous drawing power of Philadelphia as a vacation objective.

VACATION RECEIPTS IN
PRINCIPAL RESORT AREAS
1956

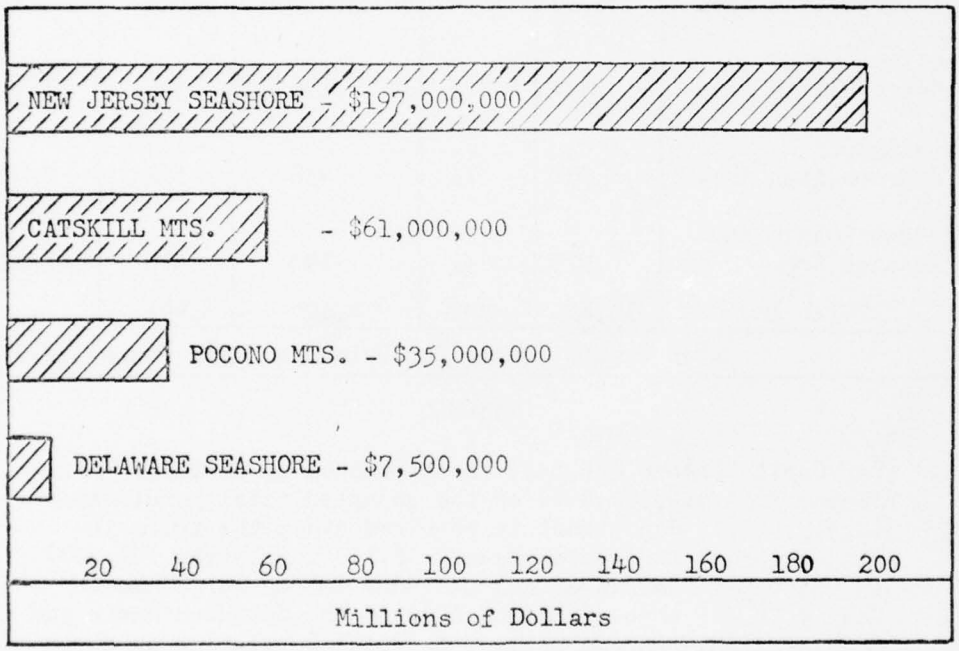


TABLE 3

93. Vacation dollars are spent throughout the Basin; however, seven of the counties receive the lion's share. The three southern New Jersey seashore counties reap nearly two-thirds of the vacation harvest and Atlantic City alone accounts for more than one-half of New Jersey's portion. Atlantic County is far out in front as the largest resort center. In 1956, vacationers spent 115 million dollars in this resort and all but a fairly small portion of this amount is attributed to Greater Atlantic City which ranks in first place - be it number of employees, or number of lodging places, miles of boardwalk, or diversity of attractions. Vacationers brought funds into the county at the rate of $750 per permanent resident, or more than $2,000 per family. This arterial flow of

vacation dollars is the lifeblood of the area*.(14)

94. Cape May County, on the southern tip of New Jersey, ranks second to Atlantic County in total vacation receipts, with more than 50 million dollars. Travel and vacation dollars are of great importance to the economy of Cape May County, where vacation expenditures in 1956 were equivalent to more than $1,250 per permanent resident, and very close to the per capita income of the county. Both Cape May and Atlantic Counties received more than $200,000 per square mile from vacationers in 1956. Neither expenditure per permanent resident nor expenditures per square mile should be interpreted as measures of efficiency, but both are indications of the impact and concentration of vacationers on the area and its permanent residents.

95. Ocean County received approximately 32 million dollars from vacationers in 1956. The emphasis here is on rental units and a large portion of privately-owned cottages. The presence of a large group of semi-residents adds stability to the travel and vacation industry of the area.

96. The Delaware seashore lies entirely in Sussex County and the principal resort center is Rehoboth Beach. Smaller resorts are located at Lewes and Fenwick Island near the Delaware-Maryland state line. A large portion of the vacationers along the Delaware Coast own their own cottages. Compared to the New Jersey shore counties, the volume of vacation business is small (approximately 7.5 million dollars in 1956), but the area in which it operates is also small.

97. In the mountainous area of the Basin, the Catskills and the Poconos are the outstanding vacation centers with total gross vacation receipts amounting to nearly 100 million dollars. The Catskill Mountains in Delaware and Sullivan Counties, New York, account for approximately two-thirds of this business. Sullivan County is the hub of this famous resort region. Its 385 hotels with 28,000 guest rooms will accommodate 85,000 vacationists at one time during the summer months, and the motels, family unit cottages, rooming houses, camps, vacation farms, and miscellaneous accommodations provide housing for the 600,000 vacationists who visit the Catskill annually. The income from this travel and vacation industry in Sullivan County alone amounted to 61 million dollars in 1957.(15)

98. The Pocono Mountains, in Monroe and Pike Counties, are Pennsylvania's most outstanding resort area. These two counties reaped a volume of 35 million dollars of vacation spending in 1956. This is equivalent to $800 for each permanent resident of the two counties. Monroe County alone is about the same magnitude as Ocean County, New Jersey.

*(14) Except where otherwise indicated, the balance of this discussion is based on "On Vacation" and "Still on Vacation", reprinted from the April and May 1958 issues of Business Review, published by the Federal Reserve Bank of Philadelphia.

But the relative impact of the vacation industry is greater in Monroe since the population is smaller. Camps for children and adults plus large self-contained resort hotels typify the Poconos.

99. The very nature of the terrain and the stress on the scenic beauties make a certain amount of self-containment mandatory within any mountain resort. The maintenance of hiking trails, the preservation of woodland, and the provision for outdoor sports all necessitate a relatively large portion of unoccupied ground. The result is an extremely heterogeneous business composition. The resort hotels and the camps generate a substantial portion of the vacation expenditures of the area.

100. Food and drink are, of course, necessities to all vacationers. Shelter is almost equally essential. So it is not surprising to find 63 cents of the vacationers' dollar going to proprietors of lodging, eating, and drinking places. Almost half of this is for lodging. Of each dollar spent, 11 cents go for amusements, like movies, summer theaters, pony golf, shooting galleries, and other forms of diversion. Seven cents covers transportation, both public and private. The remaining 19 cents can be appropriately labeled miscellaneous, to include expenditures made in grocery stores, barber shops, appliance stores, and other retail shops. All of the shops supply these miscellaneous goods and services are not generally regarded as full-fledged members of the travel and vacation industry, but their combined share of the vacation dollar is exceeded only by lodging places and eating places.

HOW THE VACATION
DOLLAR IS SPENT

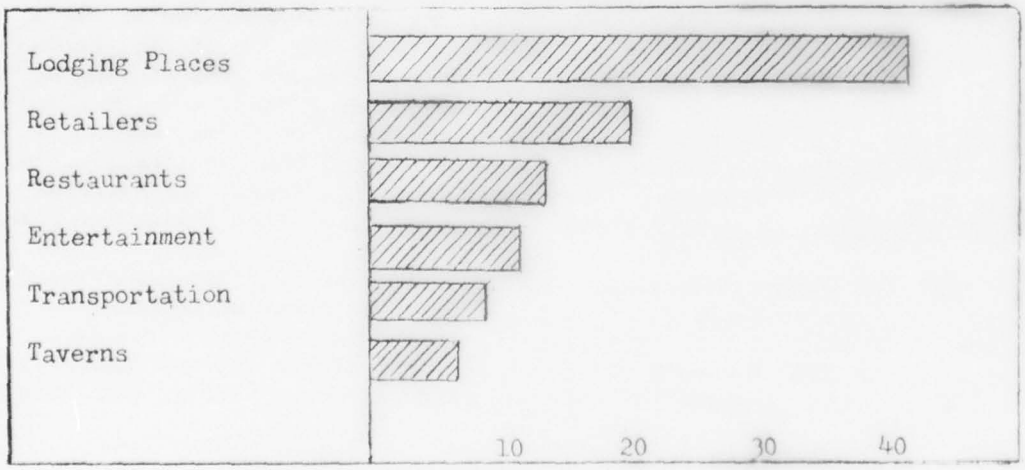


TABLE 4

101. Almost half of the expenditures for lodging, meals, and beverages are made in hotels and motels serving meals. Much of this is spent at the big resort hotels and their counterpart, the modern luxurious motels. These establishments cater to the vacationer who wants super service, the best of facilities and accommodations de luxe. The more select places, of course, have a substantial amount of capital invested, employ a sizable staff, and usually operate the year around. Some of these hotels gross over a half million dollars a year. Whether operating on the American or European plan, or whether offering guests a choice of either, it is estimated that rooms yield about 60 percent of the revenue.

102. Most of the big resort hotels offer recreational services to their guests without additional charge. Obviously, costs are incurred for these services and such costs must be included in the rates charged. About 5 percent of the gross covers these costs, according to estimates of officials and managers.

103. Vacation dollars, howsoever spent, have, in addition to an immediate impact, a generating effect on the local resort economy. The recipients of the dollars are just as ready spenders as the vacationers, and sothere are second and third rounds of spending initially unleashed by the vacationers.

104. The travel and vacation industry is beset with two major problems; seasonality and the need for modern facilities and services. One of the best reflectors of seasonality is the luxury tax collected at resort centers. Almost 40 percent of the Atlantic City luxury tax is received in the months of July and August. Extend the period to include June and September, and the tax collections for the four summer months almost reach 60 percent.

105. Annual off-season hibernation is the curse of the travel and vacation industry, and this seasonality is worse in some resort centers than others. Among the seashore resorts, 60 percent of the retail and service establishments at Atlantic City operate the year around. Here, there are facilities for lodging and entertaining guests both in season and out of season. Conventions are attracted every month of the year, partly because of promotional efforts to attract business in the off season. Special events are scheduled for holidays and weekends to encourage off-peak vacations.

106. Ocean and Cape May Counties in New Jersey and Sussex County, Delaware, have been considerably less successful in attracting off-season visitors. Here, as in most resort areas, the season opens with Memorial Day and closes with Labor Day. The peak comes during July and August. The winter season activities at Lakewood augment the recreation economy of Ocean County somewhat.

107. The Catskills and the Poconos each have a few resorts which stay open all year. These are normally the large, self-contained establishments with facilities for winter sports. Hunting, hiking, and skiing are off-season attractions - and so is honeymooning, Numerous smaller

places, particularly rooming houses, remain open during the winter months to accommodate weekend skiers from the surrounding metropolitan areas.

108. One of the serious effects of seasonality in the vacation industry is the idle labor force that is created with the closing of resorts. Fortunately, some of the off-season unemployment is voluntary. The industry draws heavily on college and high school students who are in the labor market only during the summer. Moreover there is a body of migrant workers who travel south in the winter. Nevertheless, seasonal unemployment is a real problem as reflected in sharply rising unemployment claims in the resort areas during off season months.

109. The second major problem of the travel and vacation industry is obsolescence - out-of-date facilities and old-style service. In each resort area, accommodations and services range from barely passing to superb - from lax to luxe. Today's vacationer has purchasing power and when he takes his family on a vacation he expects to find most of the conveniences to which the family is accustomed. With prevailing levels of income, the limited-service establishment is rapidly losing business to the modern, full-service motel and hotel.

110. Probably the greatest change that has taken place in the vacation industry is in its market - people. This market has grown fast in recent years not only because of the rapidly growing population, but also because people have more leisure, more money, and a greater desire to travel. As long as the automobile remains the favorite mode of travel, the seashore and mountain resorts of the Basin are highly favored.

111. The resorts of Sussex County, Delaware have the good fortune of being close to Baltimore and Washington, which are cities of about equal size, with Washington probably the most depression-proof city in the country.

112. The Poconos and the Catskills are doubly favored. They are both at the back door of Philadelphia and New York City respectively and planned highway improvements will bring these metropolitan centers even closer to each resort area.

113. The New Jersey seashore resorts, so easily accessible to the vacationers of the Philadelphia Metropolitan Area, are now easily reached by vacationers from New York, via the New Jersey Turnpike and the Garden State Parkway.

114. With such a huge market so close at hand, the major resort centers of the Basin could hardly be better located. If they provide the kinds of services and facilities that vacationers expect, the industry should prosper.

HIGHWAYS

115. The entire length and breadth of the Basin is interlaced with hard-surfaced, all-weather highways that provide ready access to all parts of the Basin during any season of the year. The road system in the Pocono region above Stroudsburg, Pennsylvania, and in the northwestern portion of the Catskills is more open, due to the mountainous character of the terrain. Highway access to existing recreation areas and resort regions is not a problem in itself in that good highways now exist in and close to these areas. However, the ability of these systems to accommodate the tremendous weekend exodus from the metropolitan areas is limited.

116. The modern highway of today is a high-speed, limited-access throughway, commonly referred to as a "turnpike". Three such highways serve portions of the Delaware River Basin and the included study area; the Pennsylvania Turnpike with its Northeast Extension, the New Jersey Turnpike and the Garden State Parkway. The former, extending eastward from Pittsburgh to Philadelphia, funnels vehicular traffic into the Philadelphia area and connects with the New Jersey Turnpike, leading to the New York City Area. The Northeast Extension of the Pennsylvania Turnpike extends northward from the Philadelphia area directly through the Pocono Mountain resort region.

117. These two superhighways are tremendously important arteries for recreation travel. Not only does the Pennsylvania Turnpike bring recreationists into the Basin from outside but, more importantly, it provides an avenue of egress for the dwellers of Metropolitan Philadelphia to reach recreation areas, in the central part of the State and beyond. The Northeast Extension provides a direct access route to the Pocono Mountain resort area and the State parks and forests of the region. With the opening of this throughway, visitation to these public areas increased materially.

118. The New Jersey Turnpike extends from U.S. 46 in the vicinity of George Washington Bridge to the Delaware Memorial Bridge near Wilmington, Delaware. In addition to its use for through traffic between New York and Philadelphia and points beyond, it carries a substantial volume of traffic, particularly during the summer months, to connecting routes to the New Jersey and Delaware seashore resorts.

119. The Garden State Parkway is essentially a recreation express highway, although commercial traffic is permitted over a portion of its length. This traffic artery serves the New Jersey resort centers from Sandy Hook to Cape May, and connects with the New Jersey Turnpike, the New York Throughway, and other express highways in the Greater New York area.

120. Numerous state and federal-aid highways radiate from the metropolitan areas and traverse the Basin in all directions. U.S. 13 in Delaware is a four-lane, divided highway, extending from north to south, and forms the backbone of the State's highway system. New York

State Route 17 is being rebuilt into a limited access, four-lane, divided highway that will greatly facilitate travel from the New York Metropolitan Area to the Catskill resort region and the Catskill Park. Similarly, other U.S. and state highways provide access and circulation routes throughout the Basin.

121. A superficial glance at a road map of the Delaware River Basin would indicate an intricate cobweb of roadways serving all areas. Basically this situation does exist; however, this network of highways is grossly inadequate to serve the needs of this metropolitan region. Highway development has not kept pace with the increase in automobile use. This great inadequacy makes itself apparent in the never-ending traffic jams that occur daily and particularly on weekends in the vicinity of recreation areas. Recreationists stream from the cities on Friday afternoons and evenings and become entangled in bumper-to-bumper traffic for miles on end. Again on Sunday afternoons and evenings, never-ending streams of automobiles become bogged down in jams on two-lane roads, at one-way bridges, traffic lights, toll bridges, traffic circles, and grade crossings.

122. Each of the Basin States is cognizant of its needs for improved circulation routes and steps are now being taken to provide high-speed throughways for the more expeditious handling of traffic problem areas. The City of Philadelphia now has under construction a project that will directly connect the heart of the city and the Pennsylvania Turnpike. Plans are well advanced for the construction of an expressway between Philadelphia and Wilmington, where now an inadequate highway exists through a heavily congested area. The State of New Jersey is planning the construction of a system of limited-access highways between the Camden-Philadelphia area and the South Jersey Shore, where one of the most critical traffic situations now exists. The "Shortway" will be a turnpike connecting Stroudsburg, Pennsylvania, on the Delaware River and Sharon on the Pennsylvania-Ohio State line. The Federal-Aid Highway Act of 1956 (Public Law 627-84th Congress) will in all probability be the principal instrument by which the existing unfavorable traffic conditions will eventually be improved.

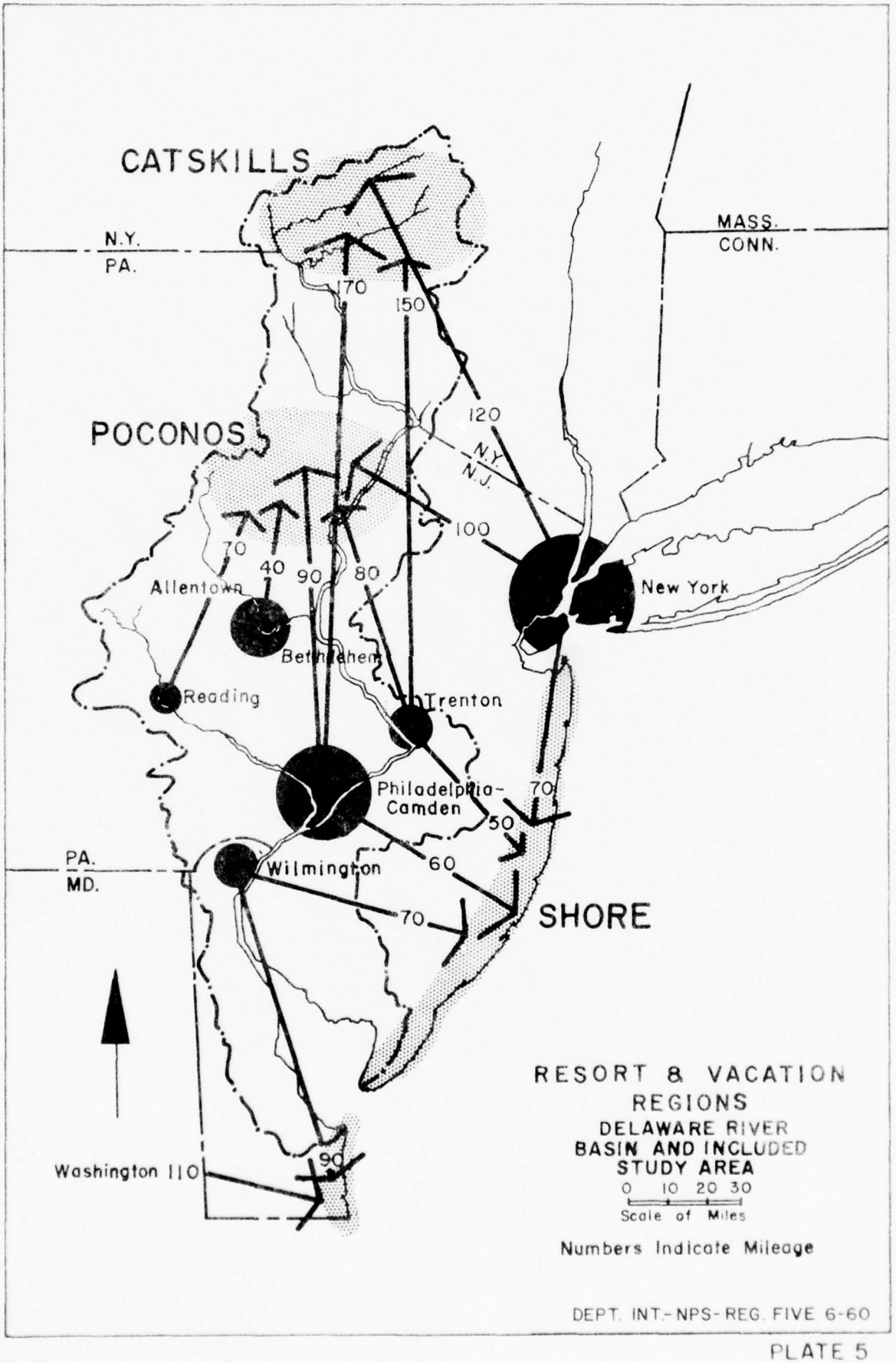

CATSKILLS
N.Y.
PA.
MASS.
CONN.
170
150
120
POCONOS
N.Y.
N.J.
100
70
40
90
80
Allentown
New York
Bethlehem
Reading
Trenton
Philadelphia-
Camden
70
50
PA.
MD.
Wilmington
60
70
SHORE
Washington 110
90
RESORT & VACATION
REGIONS
DELAWARE RIVER
BASIN AND INCLUDED
STUDY AREA
0 10 20 30
Scale of Miles
Numbers Indicate Mileage
DEPT. INT.-NPS-REG. FIVE 6-60

PLATE 5

IV. RECREATION RESOURCES

NATURAL RESOURCES

123. The area of the Delaware River Basin and the included study area possesses adequate resources for development to fulfill the nonurban recreation needs of the Basin population and the surrounding environs. The Appalachian Mountain Region offers rugged topography with changes in climate and scenery for the nearby urban dwellers. The water resources in the form of rivers, creeks, lakes, ponds, reservoirs, bays, and seashores are primary and indispensable assets to the conduct of out-of-door recreation programs, whether by Federal, state or local agencies or by private enterprise. The fish and wildlife resources are of a diversified nature and include both fresh water and salt water sport fisheries as well as upland game and waterfowl populations, which receive severe hunting pressures from the surrounding urban and metropolitan areas. The marshes of Delaware and New Jersey are very probably the sole remaining natural areas of the Basin.

TOPOGRAPHY

124. The topography of the Catskill Mountains and the Pocono Plateau has been a prime factor in the appeal of these areas for recreation use. The wildest and most rugged country within the Basin is contained in the Catskills, where much of the area is preserved essentially as a wilderness. The southern portion of the Catskills takes on the aspect of a rolling plateau dotted with countless lakes and it is here that most of the recreation activity is centered. This region is not unlike the Pocono Plateau to the southwest, which has been similarly developed as a resort center.

125. The Piedmont Plateau is characteristically rolling and interspersed with woodland and farms. Although not possessing the rugged features of the Catskills or the cooler climate of the Poconos, this region of the Basin is well adapted to nonurban recreation activities, particularly for day-use purposes. The glaciated New Jersey lake region with its numerous lakes is the most significant area.

126. The flatness of the Coastal Plain lacks variety and coupled with higher temperature during the summer is sufficient reason to cause recreationists to seek the more desirable seashore environment. The lakes, ponds, and reservoirs of this region do afford nonurban recreation opportunities and the potential resources of the Coastal Plain could be developed to provide close-at-home recreation areas for the metropolitan dwellers.

WATER OF THE BASIN

FLOWING WATERS

127. The flowing waters of the Basin vary considerably in character and quality from the north to the south. In the northern portion, [illegible]

the stream gradients are steeper, the rivers and creeks are swiftly flowing, clear, and generally appealing in a setting long recognized for their recreation value. Below the fall line, the streams are more placid and are influenced by tidal action and for the most part are lacking in the fresh attractiveness of rushing brooks and creeks. The streams of the Coastal Plain drain relatively flat country and find their meandering ways through marshes and bogs before mixing with the brackish water of the lower Delaware River and Bay.

128. The Delaware River has its source on the western slopes of the Catskill Mountains in New York, approximately 350 miles from the entrance to Delaware Bay between Cape Henlopen, Delaware and Cape May, New Jersey. The main stream is formed by the confluence of the East and West Branches at Hancock, New York. The stream gradient is progressively reduced from 21 feet per mile in the headwater reaches of both the East and West Branches until tidewater is reached at Trenton, 132 miles above the Delaware Bay entrance. Fresh water normally extends downstream to some point between Chester, Pennsylvania and New Castle, Delaware.(16)

129. Some of the more important tributaries representing the best aquatic environment in the Basin are found in New York. The Neversink and Mongaup Rivers, Beaverkill, and the East and West Branches of the Delaware are included in this group.

130. From the standpoint of drainage area and volume of flow, the most important tributaries of the Delaware are located on the western side in Pennsylvania. These are the Lackawaxen, Lehigh, and Schuylkill Rivers and Brandywine Creek, which flows through a small section of Delaware. The tributary streams of New Jersey are generally small and of lesser importance. Above the fall line, Paulins Kill, and the Pequest and Musconetcong Rivers are the most significant and in the coastal plain, the Maurice River and Ranconcas Creek are worthy of mention. Several small streams enter the river and bay from Delaware and of these, the Christina and Mispillion are of some importance. The coastal plain streams of Delaware and New Jersey are influenced by tidal action.

131. The Delaware River Basin has an abundant supply of water to serve the recreation needs of the Basin population now and in the foreseeable future. The mere presence of an adequate supply of flowing water in a pleasing environment does not necessarily mean that this resource is immediately available for development and human use. Water quality must be considered.

132. Since the time of earliest settlement until after World War II, the Delaware River and its tributaries were the depositary for wastes of all kinds. The gathering of hundreds of industries and the settling of millions of people in the Delaware Valley eventually produced too large and varied loads for the river to assimilate by dilution. More than 80 percent of the 5,000,000 persons living in the Basin enjoyed the dubious advantage of using the streams of the Basin

as a public sewerage system to service them in carrying untreated domestic wastes away from their homes and places of occupation. In 1950, the total volume of domestic sewerage discharged into the Delaware system of streams was estimated to amount to half a billion gallons daily. As late as 1950, the tidal section of the Delaware River was described as a zone of "substantial pollution to one of the most grossly polluted areas in the United States at Philadelphia and Camden".(16)

133. This despoliation of the water resources of the Basin was not confined to the main stream of the Delaware in the vicinity of metropolitan areas, but applied equally to the tributaries. This is particularly true with regard to the Lehigh and Schuylkill Rivers, which drain from the coal mining regions. By 1945, the legislature of the Commonwealth of Pennsylvania had taken cognizance of the situation in regard to the Schuylkill River and in the preamble to the Schuylkill River Distilling Act, stated; "The accumulation of wastes from mining operations, industrial processes and municipal sanitation in the Schuylkill River and its tributaries has reached the point where it constitutes a menace to health, safety and welfare of the public...".(17) The U.S. Public Health Service reported in 1954 (17) that few streams have been so severely damaged from pollution of all sorts as has the Schuylkill River. Practically no fish or other aquatic life existed in the river, and the bed and banks were so choked with culm and silt that swimming and other recreational activities were next to impossible. The Schuylkill River was a striking example of a stream so wantonly abused that it became little more than a common sewer. In its early pristine state, it formed a scenic transportation route for delivering the anthracite coal produced in its headwaters to the markets downstream. Coal production was the principal factor causing its gross degradation.

134. Much has been done to bring about a restoration of the Schuylkill River to a desired quality of water for the expected principal uses of municipal and industrial water supply, fishing, recreation, and other utilizations. Since the Commonwealth of Pennsylvania and the Federal Government through the Corps of Engineers, Department of the Army, have dredged the river of accumulated coal culm and silt from the coal region downstream to Philadelphia, the recreation facilities of the region have been restored and the river is now used for swimming, boating, and fishing. With the restoration of the river to a degree of respectability it is surprising how quickly people have recognized and accepted the opportunity to use the renewed recreation values of the river. Summer cabins along the river, many of them long abandoned, have been renovated and put back in service. New homes are being built and property values have increased.

135. The Lehigh River has fared no better than the Schuylkill, but it too has joined the growing ranks of streams that have recovered from a grossly polluted condition to a clean stream, as the result of water pollution abatement programs.

136. The entire Delaware Basin north of Trenton is generally clean and relatively unpolluted, except for localized areas. Former pollution conditions that existed on the lower Lehigh River and on the Delaware below Port Jervis and Easton have been corrected to a large extent. The vastly improved condition of the Lehigh, and the return of fishing and other recreation, exemplifies the benefits that may be achieved from pollution prevention and abatement.(18)

137. The Delaware River and the sections of its tributaries influenced by tidal action are of poor recreation quality, particularly during periods of minimum flow in late summer and autumn. In general, the tributary streams above tidal influence are of satisfactory quality for all appropriate purposes.(19)

138. Camping, boating, and recreation in the lower tidal section of the river reached the low ebb about 1942. By 1952, some boating and yachting had reappeared, and this activity has been steadily on the increase ever since. Sport fishing has returned to the lower section of the tidal portion of the river and is now a major activity on both sides and is increasing on the river as well as at every available bank fishing location.

139. The upper part of Delaware Bay receives the polluted waters of the river, and it is only in the middle and lower sections of the bay that the water quality is such as to encourage sport fishing and swimming. Several small boat facilities are located along the New Jersey shore of the bay and boat liveries are found on the Delaware side for the use of fishermen. Bathing beaches have been developed and swimming in safe water is possible.

140. In 1955, Francis A. Pitkin, Director, Bureau of Community Development, Pennsylvania Department of Commerce, reported, "At the present time, the construction of sewage and industrial waste treatment plants, necessary to handle almost every potential source of pollution of material significance, has been completed throughout the length and breadth of the Delaware Basin".(20) Since 1955, pollution abatement programs have been strengthened throughout the Basin and it is reasonable to assume that in the foreseeable future, the main stem of the Delaware and its principal tributaries will again be useful recreation resources. The value of the flowing waters of the Delaware Basin as a recreation resource are beyond calculation; however, their usefulness in fulfilling the recreation needs of a steadily growing population is directly proportional to their sustained purity.

LAKES PONDS AND RESERVOIRS

141. There are more than 500 lakes, ponds, and reservoirs within the limits of the Delaware River Basin and the included study area. Many of these water bodies in the northern portion of the Basin are natural lakes formed by glacial action, while others are man-made reservoirs created for domestic water supplies, power developments, or canal flow regulation. Approximately one-fifth of these lakes are 100

acres or larger in size. The water impoundments in the Catskill Mountains, Pocono Plateau, and the New Jersey lake region possess greater recreation value than the lakes, ponds, and reservoirs in the southern half of the Basin.

142. There are approximately 57 water impoundments with an aggregate surface area of 16,124 acres in the New York portion of the Basin. Of this number, 30 water bodies with an area of 4,936 acres are closed to public use. This lake region of New York is centered in Sullivan County, which has been intensively developed with resort type recreation facilities. Wherever possible, these developments have been made around some water area. Private cottage developments occupy the shoreline of many lakes and some have been ringed by two or more tiers. The recreation value of these lakes was recognized long ago by private enterprise and have been developed for commercial recreation purposes.

143. The lake region of the Pennsylvania portion of the Basin is centered in Wayne, Pike, and Monroe Counties and is coincident with the Pocono Mountains resort area. There are approximately 302 lakes, ponds, and reservoirs, with a total surface area of 22,814 acres in the Basin portion of the State. One hundred of these water bodies are closed to the public and fourteen are owned by the State and contained within state parks, state forests, or public hunting and fishing grounds, and are available to the public for recreation purposes. Here, as in the Catskills, resorts and cottage colonies occupy the shorelines of most lakes.

144. Northwestern New Jersey is dotted with water areas. There are 92 lakes, ponds, and reservoirs, with a surface area of 9,414 acres in the Basin portion of the State and most of these are located in Sussex and Warren Counties. Small, less attractive lakes are also found in the southern portion of the State. Virtually every lake in the New Jersey portion of the Basin is being used for recreation purposes, and most of this use is associated with privately-owned cottage developments. The State owns twelve water bodies, which are contained within state parks, state forests, or public hunting and shooting grounds.

145. There are 57 water impoundments with a total surface area of 3,976 acres in the Delaware portion of the Basin and the included study area of the State. Almost without exception, these impoundments were constructed to provide water power for milling purposes. These areas now provide recreation in the form of swimming, fishing, boating, and hunting, thirteen of these ponds with a total area of 1,610 acres are closed to public access. The State, recognizing the value of these ponds for recreation purposes, is undertaking a program of acquisition and restoration primarily for use as public fishing grounds. The provision of public access points on lakes, ponds, rivers, and other water areas is part of this over-all program. Many of the better sites have been utilized for private cottage developments and residential areas.

Unlike the lakes in the northern portion of the Basin, these ponds are least attractive for swimming during the hot summer months, because of the water temperature and the presence of algae; however, these conditions seem to have little effect in regard to fishing activities.

DELAWARE BAY

146. The tremendous expanse of Delaware Bay constitutes a potential recreation resource of great value. The bay is now used for sport fishing from both the Delaware and New Jersey shores and to a limited extent for swimming. Water quality and attractiveness are problems to be overcome. Increased recreation use of the bay in recent years is an indication of improved water quality and more intensive use is very probably due to psychological barriers created by the many years of polluted conditions which typified bay waters. Recent tests of water quality have indicated that bay waters are satisfactory for recreation purposes.

147. The character of the bottom in many places is hardly suitable for beach developments and swimming and at low tide, extensive mud flats are exposed. However, there are numerous sites where good bottom and sandy beaches do occur. For the most part the beaches are narrow and the best swimming water is available at high tide.

148. The shore of the bay, for the most part, is low and marshy and not readily adaptable for recreation development except through filling. Most of the high ground has been developed into cottage colonies.

149. The present undesirability of Delaware Bay and the bay shore for recreation is somewhat indicated by the general absence of recreation facilities both public and private. Present facilities are meager in extent and quality. At one time, substantial recreation establishments flourished and attracted many visitors by river excursion boats and the family horse and wagon. The nearness and attractiveness of the seashore plus the family automobile have so overshadowed the bay as a recreation area that it has for all practical purposes, been forgotten by the public.

SEASHORE

150. Within the included study areas of Delaware and New Jersey there are 25 miles and 125 miles of ocean frontage respectively. This mileage could be increased many fold if the shores of coastal bays and islands were included. These coastal regions are the most significant recreation resource available to the Basin population and are more heavily used than any region within the Basin.

151. The 14.6 miles of ocean front owned by the State of Delaware is in a semi-natural state characterized by a wide sandy foreshore and barrier dune. The area behind the dune is covered by a vegetative cover consisting primarily of groundsel, bayberry scrub, and beach grass. On the higher dunes are virtually pure stands of pitch pine which have persisted undisturbed. For the most part, these state-owned

beach lands constitute a barrier beach between the ocean and Rehoboth, Indian River and Little Assowoman Bays which are also owned by the State.

152. The total recreation value of this coastal area is incalculable and offers unparalleled opportunities for such activities as surf and bay bathing; surf, deep-sea and bay fishing; crabbing; clamming; boating; sailing; and water recreation of every conceivable type. The State of Delaware is fully cognizant of the value of this region for public recreation and is proceeding with a plan of development which should perpetuate the area for public benefit.

153. The development and commercialization of New Jersey's ocean front has all but obliterated the natural condition that once prevailed. Slightly more than 9 miles is owned by the State. Most of the many municipalities along the shore own and maintain municipal beaches, however, in many instances the beach strand is held as private property, fenced and a fee is charged for admission. Private beaches are not uncommon and some municipalities reserve their beaches for their own residents while others charge a fee on a daily or seasonal basis. Generally, the southern half of the Jersey shore is open to the public without charge.

154. The only natural area remaining anywhere along the New Jersey shoreline is located north of Brigantine, adjacent to Brigantine National Wildlife Refuge. This area has been purchased by the Philadelphia Conservationists, Incorporated, in order to perpetuate the area as a natural wildlife habitat primarily for shorebirds and waterfowl.

155. The State of New Jersey, in recent years, has acquired a nine mile section of beach with frontage on the ocean and Barnegat Bay and dedicated the area as Island Beach State Park. It is the intent of the State to develop portions of the park for day-use activities, camping, fishing and boating and reserve a portion for the preservation of natural features including plant cover and animal life.

CANALS

156. Generally speaking, the waters of the Basin are not navigable for commercial transportation, except where dredging is done to maintain clear channels. Presently, a 40-foot channel is kept open from the ocean entrance to Delaware Bay to Philadelphia and a 25-foot channel is maintained upstream to Trenton. Many of the smaller streams emptying into Delaware Bay are dredged to provide water courses to industrial towns lying inland a short distance from navigable water.

157. Canal transportation is normally associated with a bygone era of American history. Although not used for commercial transportation, there are several section of these old waterways to be found in the Basin and some are preserved as attractions in public recreation areas. The only canal carrying commercial traffic of any consequence within



Ferries once brought recreationists to this beach on Delaware Bay. Woodland Beach, Delaware.



Delaware Bay becomes attractive for swimming near the mouth. Public beach, Lewes, Delaware.



A glimpse of what the seashore was then . . .



. . . and now

the Basin is the Chesapeake and Delaware Canal, a federally-operated waterway administered by the Corps of Engineers, Department of the Army. This canal provides a channel for ocean-going vessels between the Delaware River and Chesapeake Bay, and in 1957 there was recorded a total of 3,500 pleasure boats transits, of which 16 were foreign yachts.

158. The Intracoastal Waterway, a joint responsibility of the Corps of Engineers, state and local interests, enters the Basin by way of the Cape May Canal and traverses the full length of Delaware Bay, leaving the Basin through the Chesapeake and Delaware Canal. This waterway provides a safe route of travel for small craft to enter Delaware Bay from the north or south, and it is heavily used by recreational craft operating from basins along the New Jersey shore and Chesapeake Bay.

159. Few good harbor or boat basins exists for recreation craft anywhere in the lower or tidal portion of the Basin. At the best, marina facilities are meager and have not kept pace with the increased number of boats being used in these waters.

FORESTS

160. Approximately 50 percent of the Basin, or 6,100 square miles is forest or wild land, about half of which is located in the upper part of the Basin above Delaware Water Gap. The northern hardwoods of the birch-beech-maple-hemlock type are confined to the northeastern Pennsylvania and New York sections, while the oak-pine type is found principally in southern New Jersey. The remainder of the forest land within the Basin generally falls into the oak-hickory and oak-chestnut groups.

161. As a recreation resource, the forests of the northern portion of the Basin, including Northwestern New Jersey, are materially more significant than those in the southern portion. These forested areas are now highly developed for recreation purposes, particularly in the vicinity of water areas. In terms of direct use recreation is the most important product of these forest lands.

162. In the Piedmont and Coastal Plain Regions, forest cover is principally confined to hilltops, stream courses, and pond shores with the exception of southern New Jersey, where there are extensive forests of the oak-pine type. There are many small forested areas in the region that are suitable for park and recreation area purposes.

FISH AND WILDLIFE

163. The faunal resources of the Basin include big game, such as bear and deer; small upland game, such as cottontail rabbits and gray squirrels; numerous ducks and geese using the Atlantic flyway stop for resting, feeding, or wintering; and upland game birds, such as wild turkey, pheasants, quail, woodcock, and doves. Many species of songbirds are found throughout the Basin. The streams, ponds, lakes, reservoir, and salt water areas of the Basin support both fresh and

salt water sport fisheries of some consequence. The harvesting of this resource by hunting and fishing has long provided recreation pleasures for both the urban and rural populations of the Basin and surrounding areas.

164. The big game of the Basin was at one time a primary source of meat for the table, however, the area became "shot-out" and restocking under management programs became necessary to restore the once plentiful game. Complete legislative protection given to deer in Delaware in 1841 remained for 113 years. The first open season was held in 1954. Pennsylvania experienced a similar situation, and restocking was required in 1906. Today, as the result of scientific management, education, and law enforcement, big game hunting for deer is available in each of the four Basin States and bear are legally taken in New York and Pennsylvania.

165. Hunting for small upland game, particularly the cottontail rabbit, provides more man-days of hunting pleasure than any other species. The large amount of agricultural land in the Coastal Plain sections of Delaware and New Jersey and the Piedmont farmlands of Pennsylvania and New Jersey account for much of this favorable condition.

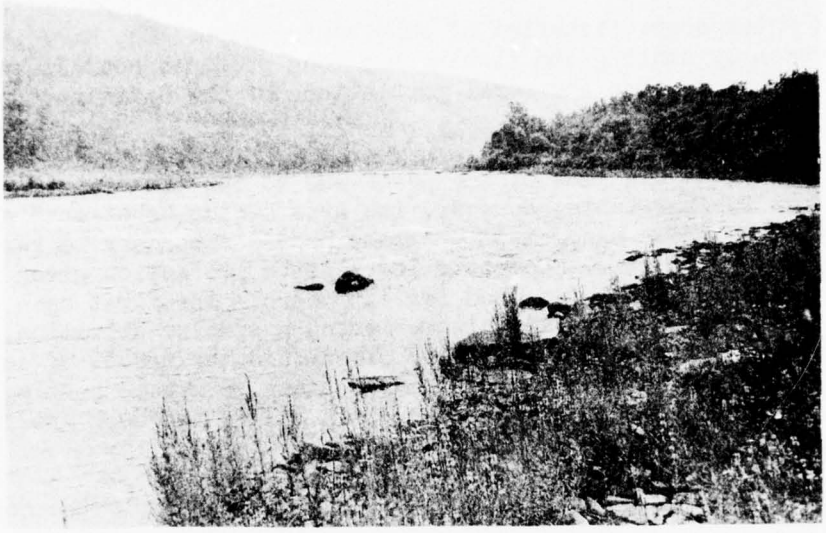
166. The wild turkey is considered to be the prize game bird of the Basin, but the relatively small number present and somewhat restricted range causes this bird to be of lesser importance than the ring-neck pheasant, quail, and grouse. Woodcocks and doves are also hunted.

167. The Basin lies within the Atlantic flyway used by migrating waterfowl. The marsh country in the southern portion of the area, particularly in New Jersey and Delaware, afford excellent waterfowl gunning. Although ducks and geese are found throughout the Basin, the most choice waterfowl areas are found in the northern lake regions and the southern marshes.

168. Fishing is an activity which offers recreation throughout the Basin for both fresh water and salt water anglers. The streams in the northern portion support populations of game fish and many are particularly renowned for trout fishing. A considerable amount of stream reclamation work has been done in Pennsylvania, and many of the streams in the middle section of the Basin now support adequate fish populations to make fishing a rewarding experience. In the southern portion, bass, crappie, and sunfish are caught in the warmer waters. Delaware Bay offers salt water fishing with such species as croaker, drum, weakfish, and others being caught.

SCENERY

169. The scenic attractions of the Delaware River Basin are typical of the Appalachian Mountains and are not unlike many other sections of the Northeastern United States. The Catskill Mountains of



Upper reaches of Delaware River.



Shohola Falls in winter.

New York offer the most rugged views in the Basin, while the Poconos are less spectacular as mountains. Excellent panoramic views are to be had in both areas and from vantage points in the highlands of Northwestern New Jersey. From existing highways along both sides of the Delaware River, superb vistas of the river gorge and the mountains on either side are available with each bend of the road.

170. The Piedmont Province of the Basin includes the renowned Pennsylvania Dutch section of the State. Many of the colonial farmsteads characterized by stone dwellings and enormous barns, decorated with multicolored hex designs, add variety and interest to the agrarian landscape.

171. The spring flower season and the fall color period are probably the most significant incentives to the sightseer in the Basin. Such species as redbud, dogwood, rhododendron, and laurel add color in the early spring and summer. The month of October is famous for the blaze of color found throughout the forested areas.

CLIMATE

172. The higher elevations in the Poconos, Catskills, and Kittatinny Mountains afford sufficient changes in climatic conditions to warrant their exploitation for non-urban recreation purposes. The hot, humid summers that characterize the urban and metropolitan areas of the Basin cause a near mass exodus to the mountains or the seashore, particularly on weekends. The mountains of the Basin offer cooler, drier air for the relief of urban dwellers.

173. The winter climate of the Basin is such that winter sports attract large numbers of visitors to the ski centers and lakes. Normally the snowfall in the Catskills is sufficient for satisfactory skiing, however, this activity is less dependable in the Poconos and Kittatinny Mountains. In all areas, artificial snow is being used to supplement natural conditions. Iceboating and ice fishing are popular in the lake regions of the Basin states.

CULTURAL RESOURCES

174. It is recognized that the term "culture" has many interpretations. For purposes of this discussion, cultural resources will be limited to archaeology and history. Archaeological and historical resources are defined as including those sites and structures which, by reason of prehistoric or historical associations, are believed worthy of preservation or commemorative marking, and those which, by their interest and accessibility, can be made available to the public for recreational and educational purposes. Historic and prehistoric sites are generally recognized as essential elements in national, state, and local recreational systems. They are in themselves an irreplaceable source of knowledge of the history of our nation. Their proper presentation to the public is a means of stimulating interest

and deriving inspirational value of our American heritage. Visual illustration of the life and problems of earlier generations help to place our present life in proper perspective. These sites when well interpreted are fascinating to the traveler. Developed sites of this nature can be economic as well as cultural assets to the communities and states in which they exist.

ARCHAEOLOGICAL

175. The Delaware River Basin is rich in prehistoric and historic cultural materials. It is true that the cultural periods of the early archaeological horizons have produced few sites. However, it does not mean there is a void. To date, there is no known Paleo-Indian site located within the Basin, although evidences of such sites do exist. The archaeological material of the Archaic Periods is likewise scanty. However, the sites for the Woodland Periods become progressively more numerous as historic times are approached.

176. Most of the hundreds of known archeological sites in the Basin are scattered along the arable, lowland flats of the Delaware River and its many tributaries. These sites suggest the agricultural orientation of the Woodland Period. Few architectural features remain, and the bulk of the information necessary for cultural reconstructions comes not from a single site but from the blending of data gleaned from many small sites. Historic archaeology, i.e., the investigation of sites founded by Europeans, is growing in importance to the historian as a source of basic data. Early settlements like Lewes and New Castle, Delaware; fortifications like Fort Mifflin (Philadelphia) and the frontier forts along the upper Delaware River in Pennsylvania and New York; pioneer industries, such as the DuPont powder mills along the Brandywine; and fine old homes like the John Bartram House and Hope Lodge have received little intensive archaeological study. Such sites provide valuable information toward completing the total picture of the early cultural patterns of the Delaware River Basin. See Appendix A, Archaeological Sites.

HISTORICAL

177. Throughout the Basin, there are many physical survivals and reminders of the 17th and 18th centuries, whether they be Dutch, Swedish, or English. There are hundreds of houses and structures built prior to 1800. Many of these have been transformed or altered as to make them unrecognizable. Fortunately, others have been preserved or restored. Period furniture and household gear of the two centuries is displayed in many of these houses. Outbuildings and commerical structures have been less cared for, but there are a few such buildings and a good many of the farm and craft tools that were used in them.

178. Some of the houses and most of the public places that have survived from the 18th century have associations with important events

or memorable personalities. An entire group of famous buildings in Philadelphia represent the "Birth of a New Nation". Stately and picturesque structures in New Castle present a vivid picture of the old colonial capital of Delaware. Aside from historic buildings, there are a number of sites that are capable of recalling many important and dramatic events. The earthworks, field guns and reconstructed soldiers' huts help to present the story of the terrible winter at Valley Forge for Washington's Continental army. The iron furnace and village at Hopewell Village National Historic Site illustrates one segment of the industrial expansion of our nation. Many significant events, of course, have left no physical traces. These can only be recalled to the visitor by plaques and roadside markers.

179. The entire region is a storehouse of historical material. Even the vacationist hurrying through to the seashore catches something of the spirit and flavor of past events. To the student of American history, the outsider returning to the haunts of his ancestors, or the leisurely visitor, it is a delight and inspiration.

180. Though urban in character, it would be remiss to omit the cultural features found in and about Philadelphia. It is not intended to give a full-scale discussion of the cultural history and opportunities found within the city, but merely to call attention to those cultural assets that may be enjoyed by the visitor.

181. Primarily known as the Home of Independence Hall, the city has been blessed with certain cultural advantages beginning with the colonial period. It reaches its zenith during the early national era when it became the cultural center of the new nation. Though Philadelphia has lost its leadership in many of the arts to other sections of the nation, it still possesses outstanding cultural traits that attract persons interested in the work and programs of such famous institutions as the American Philiosophical Society, Pennsylvania Academy of Fine Arts, the Franklin Institute, Philadelphia Museum of Art, Philadelphia Symphony Orchestra, the Aquarium, and Zoological Gardens.

182. The Historical Supplement (page 225) is a list of significant archaeological and historic sites that is not intended to be inclusive. It consists of sites generally nonurban, that are now open to the public, can be presented effectively to the public in their present state, or can be made effectively presentable through restoration or museum development. The scenes of historic events that have been changed by modern intrusion, or that have neither structures nor the possibility of effective restoration or other presentation, are not included except for a few public monuments. Sites and structures of the early period and with architectural merit that are still in private hands are included if they have outstanding historical associations, particular architectural significance, or significant grouping, such as at New Castle, Dover, and Odessa, Delaware and Moravian College, Bethlehem, Pennsylvania, even though they are located in urban areas. The classification used is that of the categories established by the Advisory Board on National Parks,

Historic Sites, Buildings and Monuments in connection with the National Historic Sites Survey.

183. The state agencies for carrying on historic sites programs vary among the several states. The State-owned historical properties of Delaware are administered by the Public Archives Commission, with the exception of Fort Christina State Park, which is under the jurisdiction of the State Highway Commission. The administration of New Jersey's historic sites is under a Supervisor of Historic Sites. This office also assists in historical work at other State-owned properties. In 1944, a majority of the historic sites in New York were transferred to the Department of Education from the Department of Conservation. Historical areas remaining under the Conservation Department are administered in conjunction with the State parks. The Pennsylvania Historical and Museum Commission does a commendable job in administering that State's historic properties. Valley Forge and Brandywine State Parks are administered through individual commissions, while Washington Crossing State Park is under the Department of Forests and Waters.

184. All the Basin States have historical marker programs. Pennsylvania and Delaware have excellent markers of pleasing design, good location, and readability, and have published guide booklets giving location and text. New Jersey is in the process of redesigning its markers to increase their attractiveness and readability. New York's marker program was a pioneering venture started in 1927, but was not well coordinated, the markers being supplied on a first-come-first-served basis. The State Historian's office has undertaken to remedy this situation, and a systematic compilation of markers by counties has resulted from this work and plans have been formulated to increase the effectiveness of the marker program.

185. The Basin contains a great number of active county and local historical societies, which have shown considerable interest in the preservation of historic sites and structures. Many of the societies have their headquarters in historic houses containing a library and/or museum. In addition, a few societies, such as the Lehigh County Historical Society, own several historic houses that are open, or will be open, to the public from time to time. These local societies often take the lead in saving structures of historical value.

COMMERCIAL RESOURCES

186. "Where land and sea meet, especially when they meet on a gentle, sandy gradient, there the travel and vacation industry is prone to flourish. The industry also abounds inland where nature, over eons of time, used her glacial bulldozers to rough up the land mass, to scoop out great valleys leaving lofty mountains and rangy ridges, smoothly carved by dripping clouds, flowing waters, and sweeping winds and decorated with a profusion of vegetation. Thus nature wrought an invitation to the travel and vacation industry".(14)

187. Very probably, the resort industry in America was born in the Delaware River Basin. Cape May, New Jersey as a resort area dates back to the very early 1800's; a group of Philadelphia Quakers established a resort at Buckhills Falls in the Poconos in 1847; Atlantic City built its first boardwalk in 1870; the Catskill Mountains have been used as a vacationland by New Yorkers for a century. The population of the Basin has long turned to commercial developments for relaxation and vacation pleasure and private enterprise has responded by catering to every whim of the vacationist. The type of services and vacation pleasures provided by private enterprise is normally contrary to those provided by public agencies.

188. Commercial recreation developments in the Basin are discussed for each state in the section entitled Recreation Developments.

V. INVENTORY OF NONURBAN RECREATION AREAS

(See Plate 6 following page 81)

189. Within the Delaware River Basin and included study area there are 227 publicly-owned areas devoted wholly or in part to nonurban recreation purposes. Of this number, only three are administered by the Federal Government with the remainder being administered at the State or county level. The many municipalities, including the large metropolitan cities, have not been active in providing recreation areas and facilities in nonurban sections of the Basin.

190. Table 5 indicates the distribution of these areas by State and general type, and Plate 6 indicates the geographic location within the Basin and included study area.

PUBLIC NONURBAN RECREATION AREAS IN THE
DELAWARE RIVER BASIN AND INCLUDED STUDY AREA

TYPE OF AREA	DEL.	N.J.	N.Y.	PA.	TOTAL
Parks and Recreation Areas					
State	3	15	-	13	31
County	*16	24	-	15	55
Municipal	4	-	-	5	9
Forests					
State	6	8	-	1	15
Public Hunting and/or Fishing Areas					
State	28	33	1	37	99
Wildlife Refuges					
National	1	2	-	-	3
Historic Sites					
National	-	-	-	1	1
State	1	3	-	4	8
County	-	-	1	-	1
Forest-Park Reservation					
State	-	2	1	-	3
Miscellaneous					
Federal Reservation (C.& D.Canal)	1	-	-	-	1
State Beach Lands	1	-	-	-	1
TOTAL	61	87	3	76	227

*Residues from Suburban Developments

TABLE 5

FEDERAL AREAS

191. In the Delaware River Basin, only two agencies of the Federal Government, the National Park Service and the United States Fish and Wildlife Service, administer land areas that contribute to the nonurban recreation needs of the Basin population. Both of these Services are bureaus of the Department of the Interior.

NATIONAL PARK SERVICE

192. It is the responsibility of the National Park Service to "promote and regulate the use of the Federal areas known as national parks, monuments and reservations....by such means and measures as conform to the fundamental purpose of the....parks, monuments and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations".(22)

193. In 1936 the Congress passed an act which declared that "it is a national policy to preserve for public use historic sites, buildings and objects of national significance for the inspiration and benefit of the people of the United States".(23) This act authorized the Secretary of the Interior, through the National Park Service, "to restore, rehabilitate, preserve, and maintain historic or prehistoric sites, buildings, objects and properties of national historical or archaeological significance and where deemed desirable, establish and maintain museums in connection therewith" and to operate and maintain such historic and archaeological sites for the benefit of the public. In accordance with this Act, Hopewell Village National Historic Site was established August 3, 1938.

Hopewell Village National Historic Site

194. This historic site, consisting of 848 acres, is the only federally-owned area administered by the National Park Service, located within the Basin and outside of Philadelphia. Here, the Service is in the process of restoring an early American ironmaking village that was operated from 1770 to 1883 for the production of iron castings and pig iron. The site today includes the original furnace stack, water wheel for operating the air compressors, a large charcoal house, the blacksmith shop, some of the old tenant houses, the water raceways and the Ironmaster's Mansion and several of the outbuildings.

195. Hopewell Village is located 37 miles northwest of Philadelphia and can be reached from Philadelphia and Reading via U.S. 422, State Route 82, and hard-surfaced county roads. From the south, the area can be reached over State Route 23 and hard-surfaced county roads. It is close to the Morgantown Interchange of the Pennsylvania Turnpike.

196. No recreation facilities such as camp or picnic areas are provided within the area. Such facilities are available at French

Creek State Park, which adjoins the site and is described in another section of this report.

UNITED STATES FISH AND WILDLIFE SERVICE

197. The United States Fish and Wildlife Service was created in the Department of the Interior as provided by the Fish and Wildlife Act of 1956.(24) It replaced and succeeded the former Fish and Wildlife Service, Department of the Interior. The new Service is composed of the Bureau of Commercial Fisheries and the Bureau of Sport Fisheries and Wildlife. The Service through the Bureau of Sport Fisheries and Wildlife is responsible for wild birds, terrestrial mammals, and sport fisheries.

198. The objectives of the Service with regard to sport fisheries and wildlife are to insure the conservation of the Nation's wild birds, mammals and sport fish, both for their recreational and economic values, with a view to preventing their destruction or depletion, and to encourage the maximum present use of the Nation's fish and wildlife resources that is compatible with their perpetuity. This objective is to be achieved by the acquisition and application of fundamental knowledge necessary for intelligent management of fish and wildlife resources so that hunters, anglers, and others may continue to enjoy and use these resources.

199. The Fish and Wildlife Service is assigned the responsibility of performing, among other things, the following function: The conservation of migratory bird resources through a national system of strategically located wildlife lands managed to serve primarily as nesting, resting, and wintering sanctuaries for migratory birds. Incidental to this main purpose, these lands also yield substantial benefits to big game, upland birds, other wildlife, and to public recreation.

200. Within the Delaware River Basin there are three national wildlife refuges with a total of 32,216 acres devoted primarily to the protection of migratory waterfowl.

Bombay Hook National Wildlife Refuge

201. Located in Kent County, Del., this refuge is the only federally-owned and administered area in the State that contributes to the fulfillment of nonurban recreation needs. The primary purpose of the refuge is to provide a haven for migratory waterfowl. In so doing, it improves waterfowl hunting opportunities on private and State-owned hunting areas adjacent to refuge lands. Hunting for upland game, including deer, is permitted on 1,300 acres of refuge land; however, bird watching is considered to be a more important activity, particularly from the standpoint of number of participants. Other activities such as fishing, picnicking, and camping are relatively minor.

202. This refuge is located on the shore of Delaware Bay and consists of 12,612 acres of water and marsh and 1,300 acres of upland.

Brigantine National Wildlife Refuge (Included Study Area)

203. This refuge is located on the coast in Atlantic County, N.J., 11 miles north of Atlantic City and is accessible over U.S. 9.

204. The 15,942 acres in the refuge consist primarily of tidal marsh interspersed with tidal bays and channels. Scrub pine and mixed hardwood constitute the cover of a brushy upland section in the western portion of the refuge.

205. The refuge was created primarily for the protection and management of waterfowl in the Atlantic Flyway. Habitat and protection are afforded to all indigenous wildlife, which presents opportunities for the management of species by applied research and/or harvest of surpluses.

206. Recreation use of the refuge includes opportunities for public waterfowl hunting on two units, sport fishing, bird watching, nature study, photography, etc. There are no facilities for such activities as picnics, camping, or swimming.

Killcohook National Wildlife Refuge

207. This refuge, containing 1,362 acres, is situated on the east shore of the Delaware River in Salem County, N.J., at the head of Delaware Bay approximately five miles northwest of the Town of Salem.

208. Ownership of the refuge lands is in the Corps of Engineers, Department of the Army, which uses the area for the deposit of material dredged from the channel of the Delaware River. The Fish and Wildlife Service has secondary rights. Only a small percentage of the area is presently useable for specific wildlife management.

209. There are no recreation facilities provided. Bird watching is the principal recreation activity and 258 species have been recorded in the area.

STATE AREAS - DELAWARE (See Table 6 following page 50)

210. Within the framework of the State government, 5 different agencies are concerned with the management of State-owned lands which are used for nonurban recreation activities or which possess recreation potential. These agencies are the State Park Commission, the State Highway Commission, the State Forestry Commission, the Board of Game and Fish Commissioners, and the Public Archives Commission. These agencies administer 3 State parks, 6 State forests, 28 wildlife and fishing areas, 1 historic site and 1 State beach within the Basin portion of Delaware and the included study area of the State.

STATE PARKS

211. The Delaware State Park Commission was established to protect

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scenic, historic, scientific, prehistoric, and wildlife resources and to make them available to the public (25), and to develop lands for recreation. All State parks and other areas acquired primarily for recreation are closed to hunting.(26) The Commission administers three State parks with an aggregate of 1,079 acres.

Brandywine Springs State Park

212. Located in the Brandywine Creek drainage of the Piedmont Plateau at the suburban fringe of Wilmington, this 59-acre park is readily accessible from the surrounding area. State Route 41 forms the west boundary of the park and is the principal access route. The park is situated in a wooded area of varying topography and contains two streams.

213. Visitation to the park originates in the surrounding urban and suburban communities and is attracted by the sylvan setting and limited facilities that are not provided elsewhere in the general area. Facilities are available for family and group picnics, and a playfield is provided for sports and games. The park is in heavy demand as a setting for day camps. Informal nature study and hiking are popular activities. During 1956, 18,000 visitors used the park.

214. Plans have been prepared for the intensive development of the park by the addition of facilities for swimming, picnic areas, softball fields, children's play area, day camp, roads, and trails.

Fort Delaware State Park

215. Infamous as a Federal military prison for Confederate prisoners of war, Fort Delaware was completed in 1860 on Pea Patch Island in the Delaware River. This huge granite pentagon, with jutting bastions, tiers of empty gun ports, water-filled moat, drawbridge and sally port, presents a grim and determined appearance. Two, three-story brick buildings standing in the spacious courtyard once served as barracks, officer's quarters, and guardrooms.

216. The exterior walls of the fort are in excellent condition. The brick structures in the courtyard have not been so durable; yet they remain in fairly good condition. The fort has suffered at the hands of vandals and salvage operations, which removed guns, cannon balls and all bronze fixtures.

217. Having been recently acquired by the State, there were no visitor facilities available in 1957; however, one room is being restored for use as a museum by the Fort Delaware Society, an independent advisory group. No definite plans have been prepared for the development of the surrounding 60-acre island.

218. The park can be reached by boat from Delaware City. Water taxi service is available on weekends during the summer. An estimated 1,500 persons visited the area during 1956.



Fort Delaware, once proud defender of Philadelphia and infamous prison for confederate prisoners of war. Fort Delaware State Park, Delaware.



Shaded beach and picnic area in Trap Pond State Park, Delaware.

Trap Pond State Park (Included Study Area)

219. This 960-acre park is located in Sussex County in the extreme south central position of the State, five miles southeast of Laurel. The park is accessible over State Route 24.

220. The principal feature is 60-acre Trap Pond, around which are located picnic and swimming areas on a segregated basis, a temporary camping area, playfields and concession facilities. The flat topography is covered by good stands of pine and abandoned agricultural fields. Small areas of cypress swamp add interesting variety to the park.

221. Approximately 160,000 visitors from the surrounding urban and rural communities used the park during 1956.

STATE FORESTS

222. The Delaware State Forestry Department administers a total of 4,709 acres of forest land divided among six State forests that range in size from 5-acres to 2,820-acres. Three of these forests are within the included study area.

223. The Department is authorized to set aside unusual historic groves or natural features and make them accessible for public use and recreation, and to make expenditures from any funds available, and not otherwise allocated, for managing and developing such lands as State forests or State parks, as in the judgement of the Department, will further the forest and park interests of the State.(27) The present goal of forest management on State forest lands is directed primarily toward saw-timber production.(28)

Appenzellar State Forest

224. This forest of 45 acres in Sussex County has no recreational development or use, except hunting.

Blackbird State Forest

225. This hardwood forest of 676 acres in New Castle County, 5-miles northwest of Smyrna, can be reached over State Route 471 from U.S. 13. The forest cover of hardwoods present a considerably more pleasing environment than the mixed pine stands characteristic of the forests in the southern part of the State. Two small streams run through the forest.

226. There are no facilities for recreational activity, and the only use made of the area is for hunting and very limited fishing.

Ellendale State Forest (Included Study Area)

227. Located in Sussex County, 6-miles northwest of Georgetown, this 993-acre forest is cut by U.S. 113. This forest was 80 percent worked over by the former Civilian Conservation Corps as a forested improvement project. The forest cover consists of dense stands of mixed pines of little aesthetic value.

228. This forest has one planned and well-developed roadside picnic area that receives fairly heavy use from the surrounding communities as well as passers-by on the highway. One other roadside stop is available.

229. Upland hunting is permitted.

Owens Tract State Forest (Included Study Area)

230. Similar in character to Redden and Ellendale State Forests, this 170 acres is located in Sussex County, 4 miles from the village of Greenwood, and is reached over State Route 16 and U.S. 13 and 113.

231. One roadside stop is available. Hunting is permitted.

Red Lion State Forest

232. This 5-acre area, located in New Castle County, 11 miles southwest of Wilmington adjacent to U.S. 13 (Du Pont Parkway) at Red Lion Creek, is a reforested area now being used as roadside picnic area. Developed in 1954, this roadside area has been so heavily used that soil compaction is evident and damage to the sheltering pines will probably occur.

Redden State Forest (Included Study Area)

233. Consisting of three tracts, this State forest, aggregating 2,820 acres, located in Sussex County, 5 miles north of Georgetown, is divided by U.S. 113 and is readily accessible. Ranger headquarters are located here for this and two other State forests in the county. Reforestation and other silvicultural practices are being conducted to reclaim cutover and abandoned land. The forest cover consists of dense stands of mixed pines of little aesthetic value.

234. Recreational developments consists of one roadside picnic area and a lodge with limited overnight accommodations for organized civic groups.

235. Hunting for upland game is permitted.

STATE WILDLIFE AREAS

236. The Board of Game and Fish Commissioners is charged with the responsibility of protecting, conserving, and propagating all forms of protected wildlife of the State (29) and is authorized to acquire, lease , create, maintain, repair, and administer refuges, spillways, and dams for wildlife, including public hunting and fishing grounds (30) and to provide public hunting, fishing or other recreational grounds or waters to be used as areas in which the public may hunt, fish, or camp.(31)

237. Within the Basin portion and the included study area of the State, the Board administers 7 State-owned wildlife areas and 21 fishing areas, and holds under lease from the Corps of Engineers, Department of

the Army, the lands of the Chesapeake and Delaware Canal for fisheries and wildlife management. These areas have an aggregate of 14,858 acres, of which 5,000 acres are Chesapeake and Delaware Canal lands. Numerous public access points have been acquired along the shore of Delaware River, Delaware Bay, inland lakes, ponds, and streams. One hundred-acre Augustine Beach and Fowler Beach are examples of this activity.

238. The wildlife areas of the State were created and are managed primarily as free public hunting and fishing sites; however, other forms of nonurban recreation are enjoyed and encouraged wherever such activities can be carried out. For example, Petersburg Wildlife Area includes training areas for hunting dogs, extensive areas for nature study, and suitable lands for tent camping by Boy Scouts and other organizations. Assowoman Wildlife Area has picnic facilities and an organized camp for underprivileged boys.

239. The State's program of lake and pond rehabilitation offers many opportunities for increased recreation use of these areas through cooperative development with the State Park Commission. These rehabilitated lakes and ponds could fill, at least in part, a tremendous void that exists throughout the State with regard to small day use areas.

HISTORIC SITES

240. In the State of Delaware, the Public Archives Commission has supervision over the State museum and historic sites and may survey, examine, select for preservation, acquire, restore, operate, and make available for public visitation and use such historic buildings, sites, and objects as it deems worthy of preservation.(32) In addition to one historic site the State conducts and maintains an excellent roadside marker program.

John Dickinson Mansion

241. South of the Dover Air Force Base, just off U.S. 113, stands the home of the "Penman of the Revolution". John Dickinson wrote practically all of the important documents of the American Congress up to the Declaration of Independence. His best known, Letters of a Farmer in Pennsylvania, contributed in a large measure toward showing the colonists that their rights as freemen were being abused by the English Parliament.

242. The brick dwelling laid in Flemish bond, was given by the National Society of Colonial Dames in America, in the State of Delaware, to the State and was restored by an appropriation of State funds. The furnishings have been contributed by patriotic organizations and individuals, and by purchases. The gardens are being developed through contributions from garden clubs of the State.

243. This State Historic Site is a good example of what can be done to preserve and make available to the public points of historic

interest. An excellent job of rehabilitation, furnishing, and providing necessary visitor facilities has been accomplished.

STATE BEACH LANDS (Included Study Area)

244. The State of Delaware owns approximately 14.6 miles (2,650 acres) of ocean front land in Sussex County. These holdings constitute two-thirds of the total ocean frontage of the State. These lands constitute a barrier beach between the Atlantic and Rehoboth and Indian River Bays and Little Assowoman Bay. State Route 14 extends through these beach lands from Rehoboth Beach to the Maryland State line. State lands north of Rehoboth Beach are not accessible by improved roads. The State Highway Department presently exercises administrative control over these lands.

245. Rather primitive camp and picnic areas have been provided as a temporary measure until such time as a master plan of development can be put into effect. The State of Delaware is interested in the creation of a State park to preserve the natural conditions that exist north of Rehoboth Beach. Day-use areas with beach and picnic facilities and camping areas for weekend and vacation purposes are planned for other sections of the beach.

COUNTY AREAS - DELAWARE

KENT COUNTY

246. None

NEW CASTLE COUNTY

247. As the result of a new zoning regulation, 68 acres of land in 16 parcels have been deeded to the County by residential developers since January 1957. These areas for the most part lie along stream courses and have not been developed for recreation use.

248. The New Castle County Park and Recreation Commission conducts studies and acts in an advisory capacity to the Levy Court Commissioners.

SUSSEX COUNTY

249. None

MUNICIPAL AREAS - DELAWARE

250. The City of Wilmington in New Castle County now owns 308 acres of land in four tracts outside the city limits. One area, Valley Gardens, is maintained as a pseudonatural area and the other three areas are undeveloped.



Camping in Delaware seashore State Beach Lands.



Restoration of ponds and lakes with parking areas and boat launching ramps are part of the program of the Delaware Board of Game and Fish Commissioners. Becks Pond, Delaware.

NONURBAN RECREATION AREAS

DELAWARE

RECREATION AREAS	COUNTY	AREA (acres)	ADMINISTRATIVE AGENCY	PRINCIPAL ATTRACTION	RECREATION ACTIVITIES														OVERNIGHT ACCOMMODATIONS						AVERAGE ANNUAL VISITATION 5 YEARS PRIOR 1957
					DAY-USE	VACATION	WINTER	SUMMER	CAMPING	PICNICS	SWIMMING	PLAYFIELD	BOATING	HIKING	WINTER SPORTS	HUNTING	FISHING	MUSEUMS	HOTEL OR LODGE		FAMILY UNIT CABINS		TENT OR TRAILER CAMPSITES	GROUP CAMPS	
																			NO.	CAP.	NO.	CAP.	NO.	NO.	CAP.	
DELAWARE (61)																										
FEDERAL AREAS (2)																										
National Wildlife Refuges (1)																										
Bombay Hook	Kent	13,912	U.S.D.I., Fish and Wildlife Service	Migratory Waterfowl and Upland Hunting	X	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	8,500
Corps of Engineers Reservation (1)																										
+ Chesapeake and Delaware Canal	New Castle	5,000	U.S. Dept. of Defense	Hunting and Fishing	X	-	X	X	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	- -
		18,912																								
STATE AREAS (39)																										
State Parks (3)																										
Brandywine Springs	New Castle	59	State Park Commission	Woodland Day-Use Park	X	-	-	X	-	X	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	18,000
Fort Delaware	New Castle	60	- do -	Civil War Fort	X	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,500
* Trap Pond	Sussex	960	- do -	Forest and Lake	X	X	X	X	X	X	X	X	X	X	-	-	X	-	-	-	-	-	30	-	-	160,000
		1,079																								
State Forest (8)																										
Appenzellar	Sussex	45	State Forestry Dept.	Forest and Game	-	-	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	- -
Blackbird	New Castle	676	- do -	- do -	-	-	X	X	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	- -
* Ellendale	Sussex	993	- do -	- do -	-	-	X	-	-	X	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	- -
* Owens	Sussex	170	- do -	- do -	-	-	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	- -
Red Lion	New Castle	5	- do -	Roadside Park	-	-	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	- -
* Redden	Sussex	2,820	- do -	Forest and Game	-	-	X	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	1	30	- -
		4,709																								
Wildlife and Fishing Areas (28)																										
Appoquinimink	New Castle	35	Bd.of Game & Fish Comm.	Waterfowl, Hunting	X	-	X	X	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	- -
* Assowoman	Sussex	1,400	- do -	Upland Hunting	X	-	X	X	X	X	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	- -
Garrison Pond	Kent	95	- do -	Waterfowl Hunting and Fishing	X	-	X	X	-	-	-	-	X	-	-	X	X	-	-	-	-	-	-	-	-	- -
Little Creek	Kent	671	- do -	Waterfowl Hunting	X	-	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	- -
* Petersburg	Kent	2,800	- do -	Upland Hunting & Dog Trials	X	-	X	X	X	X	-	-	-	-	-	X	-	-	-	-	-	-	-	1	50	- -
Primehook	Sussex	635	- do -	Waterfowl & Upland Hunting	X	-	X	X	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	- -
Woodland Beach	Kent	3,500	- do -	Waterfowl Hunting	X	-	X	X	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	- -
21 Boat Launching and Fishing Sites	New Castle, Kent and Sussex	722	- do -	Boat Launching & Fishing	X	-	X	X	-	-	-	-	X	-	-	X	X	-	-	-	-	-	-	-	-	- -
		9,858																								
Historic Site (1)																										
John Dickinson Mansion	Kent	11	Public Archives Comm.	Home of the "Penman of the Revolution"	X	-	X	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	- -
		11																								
Miscellaneous (1)																										
* Beach	Sussex	2,650	Dept.of State Highways	Ocean Beach	X	-	-	X	X	X	X	-	-	-	-	X	X	-	-	-	-	-	257	-	-	150,000
		2,650																								
COUNTY AREAS (16)																										
# 16 Tracts	New Castle	68	New Castle Coordinating Park & Rec. Comm.	Green Belts	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	- -
		68																								
MUNICIPAL AREAS (4)																										
4 Recreation Areas	New Castle	308	Wilmington Park Board	Picnics	X	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	- -
		308																								
		35,872																								

+ Federally-owned and administered by the Corps of Engineers, Dept. of the Army and leased to the State of Delaware for management as a public hunting, fishing, and recreation area.

* Located in the included study area

Residues from Suburban developments

COMMERCIAL DEVELOPMENTS - DELAWARE

251. Commercial recreation developments in Delaware are centered in Sussex County in direct relation to seashore environments. With the exception of small boat liveries and limited cottage rentals at inland lakes and ponds, no resort or privately-owned and developed recreation area exists anywhere else in the State. Furthermore, present commercial developments are concentrated in the Rehoboth Beach area. Bethany Beach and Lewes also share in the total vacation activity.

252. Proximity to Baltimore and Washington makes Rehoboth easily accessible to those population centers and the people from various embassies in Washington are frequently seen in Rehoboth. Those of the social register are part of the summer population, but many others enter into the activities of the area. Rehoboth has often been referred to as the "Summer Capital" because of the number of summer homes owned by Government officials and heavy visitation from the Washington area.

253. The resorts from Lewes to Fenwick Island are small and the emphasis is frequently on fishing; deep sea, surf or bay. Unlike the seaside resorts of New Jersey, activities are centered about the ocean and the beach and include fishing, boating, and basking in the sun. A large portion of vacationers along the Delaware shore own their own cottages, however, several small hotels, motels, and numerous private homes rent rooms during the vacation season.

STATE AREAS - NEW JERSEY (See Table 7 following page 65)

254. The Department of Conservation and Economic Development, through the Bureau of Forestry, the Bureau of Parks and Recreation and the Bureau of Historic Sites, the Division of Fish and Games, is the administrative agency of the State, having jurisdiction over State-owned lands used primarily for nonurban recreation in New Jersey.(33)

255. These publicly-owned areas are fairly well distributed throughout the State and one or more are within 1-hour driving time from nearly any section of the State, making it possible to plan an afternoon visit, an all day picnic, or a week's camping trip with minimum travel. Many scenic views, interesting physiographic features, and a wide variety of plants and animal life are included within the more than 74,000 acres of State park and forest land. A portion of the State's history is preserved in historic sites and other areas under State ownership. More than 100 sites of historic significance have been marked with roadside descriptive plaques for the convenience of motorists.

STATE PARKS

256. Within the Department of Conservation and Economic Development (33) the Division of Planning and Development formulates comprehensive policies for the preservation and use of all State parks

(except those regulated by interstate compact), forests, and historic sites. A Bureau of Recreation is operative in this Division to promote a recreation program on a State-wide basis.(34) The Bureau of Parks and Recreation administers all State parks and State forest recreation areas.

257. Within the State there are 22 State parks, 15 of which are located within the Basin and included study area. The area of these parks range from 12 acres to 10,935 acres and only two of the Basin parks exceed 1,000 acres in size. The average size of the remainder is 276 acres. Two of the Basin parks are undeveloped.

258. The State parks preserve the native flora and fauna in their natural conditions and preserve areas of outstanding historic significance. All of New Jersey's State parks, except Voorhees, have been set aside as wildlife sanctuaries and hunting is prohibited. Day-use recreation facilities are provided for visitors, although only two of the Basin parks provide opportunities for camping.

Allaire State Park (Included Study Area)

259. This 1,170-acre park is located in Monmouth County, 6 miles northeast of Lakewood. County Route 524 passes through the area.

260. Allaire was once a prosperous and compact industrial community. Iron mining and smelting, its basic industry, furnished employment to several hundred workers in the early 19th century. For more than 100 years, the once thriving village has been a ghost town. The village is now being restored and opened to the public. Picnic facilities are available.

261. Approximately 10,000 persons visited the park during 1956.

262. Allaire is a good example of a type of cultural recreation often overlooked by many states. The State with the assistance of Deserted Village of Allaire Inc., a nonprofit corporation, is restoring the village in order to give the visitor a glimpse of industrial community life of a bygone era so important in the development of America. The use of this park for its historical, inspirational, and aesthetic values is more significant than the use of the available acreage for intensive recreation purposes.

Barnegat Lighthouse State Park (Included Study Area)

263. Barnegat Lighthouse stands on the northern tip of Long Beach Island and is the principal feature of this 12-acre State park located in Ocean County, 6 miles east of the Village of Barnegat on the mainland.

264. The present lighthouse was completed in 1858 to replace an earlier one built in 1834 which toppled into the water during a storm. The light continued in use for 69 years, and in 1927 a lightship was anchored off Barnegat and delegated the responsibility of standing

guard over the "Graveyard of the Atlantic".

265. The State acquired the lighthouse and surrounding property for preservation as a State park. The original light-crown, consisting of a lens assembly of 1,024 separate prisms, has been replaced and the original condition of the lighthouse has been restored as nearly as possible.

266. The park is historically significant and affords magnificent views from the top of the lighthouse. The present plan of operation is in keeping with the significance of the area, and any increase in present picnic facilities or the addition of other facilities to clutter the area would detract materially from the area.

Cranberry State Park (Undeveloped)

267. This 199-acres of land on the south shore of Cranberry Lake in Sussex County, is located 7 miles south of Newton and is readily accessible from U.S. 206. Cranberry Lake and the park property is surrounded by cottage developments and the lake is now heavily used by the cottage residents. No facilities or developments are provided for public use of the area.

Fort Mott State Park

268. This 104-acre park is located on the east bank of the Delaware River midway between Salem and Pennsville, in Salem County, and is accessible over a hard-surfaced county road connecting with State Route 49. Finns Point National Cemetery adjoins the park on the north and the Killcohook National Wildlife Refuge occupies 1,500 acres to the northwest of the park.

269. Fort Mott is strictly a day-use area catering to picnickers and sightseers. The Delaware River water quality is such that swimming has been prohibited during the past 2 years. Day-use purposes constitute the best use of the park, which could accommodate approximately twice the present capacity. Boating facilities are needed in the area and adequate sites exist in the park for this activity.

270. Fort Mott was formerly a part of the defenses guarding the port of Philadelphia. The gun mounts and underground fortifications are the primary attractions in the park. The promenade atop the revetments offers a vantage point for viewing river shipping, which passes within a few hundred yards of the shore. Recreation activities include picnicking, fishing, boating, and swimming. A natural sand beach has been developed and bathhouse facilities are available, although these are closed to public use because of poor water quality.

271. Approximately 80,000 persons visit the park annually from the surrounding counties and the metropolitan areas of Philadelphia, Camden, and Wilmington.

High Point State Park

272. In the extreme northwest corner of New Jersey, along the

crest of the Kittatinny Mountains in Sussex County, lies 10,935-acre High Point State Park. It extends from the New York State line, southwesterly along the mountain chain for a distance of 8 miles, where it joins Stokes State Forest. The park is located 8 miles northwest of the Town of Sussex, N.J. and 5 miles south of Port Jervis, N.Y. State Route 23 passes through the park and connects these two towns.

273. Day-use recreation activities are centered about 20-acre Lake Marcia where beach, bathhouse, and picnic facilities are available. In the general vicinity of this lake is the Lodge, formerly the mansion home of the donor of the park, The Inn, and the Monument dedicated to New Jersey's war dead. The monument stands on the highest point (1,803 feet) in New Jersey.

274. The area around 20-acre Sawmill Lake has been developed for camping. Campsites are complete with tent platforms or adequate tent space, fireplace, tables, and parking area. A bathing beach has been developed for the camping area.

275. Other activities include fishing, winter sports, nature study, and panoramic sightseeing.

276. New Jersey residents account for 75 percent of the park's 382,000 annual visitation, most of whom come from the metropolitan area. Eighty percent of out-of-state visitors come from the New York City area.

Hopatcong State Park

277. This State park in Morris and Sussex Counties at the western end of Lake Hopatcong, one of the largest lakes in New Jersey, can be reached from U.S. 46 and 206 and over hard-surfaced State roads. The park is located 26 miles northwest of Newark and 37 miles from Manhattan. Numerous paved roads and highways provide avenues of approach from the sprawling New York Metropolitan Area.

278. Although 2,685-acre Lake Hopatcong is in State ownership, only 107 acres of land and water at the extreme western tip of the lake is considered to be within the park. This is exclusively a day-use area for swimming and picnics. A concessioner provides a snack bar and speedboat rides for sightseeing around the lake.

279. Two hundred sixty-two thousand persons visit the park annually, most of whom come from metropolitan areas of New Jersey and New York. Less than 5 percent come from out-of-State (other than New York).

280. Improvements made in 1957 include a new bathhouse, a terraced picnic area, and an extension of the bathing beach. The limitation of available space precludes extensive developments to accommodate a greater number of visitors. Present parking facilities will accommodate only one-half of the demand.

281. The land surrounding the lake is in private ownership and has been subdivided into cottage sites. The greater bulk of the lake shore has been taken up for cottage development and concession purposes. Numerous privately-owned boat docks, beaches, and related water and recreation facilities are available to vacationers in the area.

282. The crowding of 10,000 visitors into 107 acres of park land is clearly indicative of the tremendous demand for public swimming and picnic facilities in this vacation cottage section of the State. Parking facilities will accommodate less than one-half the demand, and terraced hillsides for picnic space are inadequate to meet existing needs.

Island Beach State Park (Undeveloped) (Included Study Area)

283. A 2,200-acre stretch of barrier beach separating Barnegate Bay from the Atlantic is being preserved in an essentially natural condition as a State park. To date, no visitor facilities have been provided, yet 50,000 persons visited the area during 1956. This park occupies one of the very few remaining undeveloped stretches of beach in New Jersey.

284. It would be possible to accommodate a tremendous number of beach recreationists within the park, but to do so would require extensive developments that would, to a large extent, destroy the natural features that should be preserved.

Mount Laurel State Park (Undeveloped)

285. Located 10 miles east of Camden and accessible by paved county roads from State Route 70 at Marlton, this State park of 20 acres has not been developed for public use, and is too small to be considered for State park purposes.

Musconetcong State Park

286. Lying astride the county line between Morris and Sussex Counties, this 343-acre park includes the whole of Lake Musconetcong and a narrow fringe of the lake shore.

287. Only one small area adjacent to U.S. 206 is available for public use and no facilities are provided. Swimming and fishing are permitted and a boat livery is available.

288. Approximately 41,000 predominately local visitors use the area annually.

Parvin State Park

289. The park, located in southern New Jersey in the eastern part of Salem County and centrally located with respect to the surrounding towns of Vineland, Bridgeton, and Millville, contains 1,025 acres and includes 93-acre Parvin Lake and 14-acre Thundergust Lake, and nearly 2 miles of streams. The park is well served by hard-surfaced roads,

and is easily reached from any direction.

290. The park is entirely forested with hardwoods and pines of better-than-average quality for this section of the State. These natural woodlands contain dogwood, laurel, holly, magnolia, and many flowering plants. Birdlife is particularly abundant during the migration season. More than 9 miles of trails pass through cedar swamps and pine forests.

291. Developed recreation facilities include vacation cabins, campgrounds, picnic areas, beach, bathhouse, and playfields. Fishing and boating are permitted.

292. Since 1951, an average of 182,500 persons have visited the park annually. The greater portion of this activity is day-use and originates in the surrounding counties and towns during the week, and from Philadelphia, Camden, and Wilmington on weekends.

293. Parvin is one of New Jersey's better designed parks and it receives considerable day, weekend, and vacation use from the many urban areas in the southern portion of the State. Present facilities are meeting the demands placed upon the park; however, picnic facilities are crowded on peak days.

Princeton Battlefield State Park

294. This park of 40 acres in Mercer County, divided by County Route 583, is located at the edge of the Town of Princeton and preserves the site of the famous battle of the Revolution. No recreation facilities are provided.

Stephens State Park

295. This 222-acre park, located along a 1-mile section of the Musconetcong River, 2 miles north of Hackettstown, lies in Morris and Warren Counties. A hard-surfaced road leads directly to the park from Hackettstown and U.S. 206.

296. Public use of the park is limited to day activities for picnicking, swimming, and fishing. The Musconetcong River is considered to be one of the best trout streams within the State.

297. Metropolitan New Jersey-New York accounts for 90 percent of the 98,000 annual visitation.

Swartswood State Park

298. This park is located on the south shore of Swartswood Lake, 5 miles west of Newton and U.S. 206. A paved road provides access from Newton. The 704 land acres have about 1 mile of lake frontage.

299. There are no overnight facilities and public use in restricted to day activities. Excellent facilities for picnic, swimming, boating, and fishing are provided.

300. The metropolitan area of New Jersey-New York and Eastern Pennsylvania provide the bulk of the 98,000 annual visitation.

301. Plans presently exist for the expansion of bathing facilities and an increase in the number of picnic units.

302. Only day-use facilities for picnics and swimming are available in Swartswood. Soil compaction in the picnic area offers evidence of crowding and overuse in spite of continued expansion of these facilities.

Voorhees State Park (Included Study Area)

303. Situated in the hills of Hunterdon County, this 429-acre park is located 1 mile north of High Bridge over County Route 513. The park offers striking views of rural countryside and has facilities for picnicking.

Washington Crossing State Park

304. This park is located in Mercer County, 8 miles north of Trenton, on the east bank of the Delaware River, and extends about 1 mile back from the river. The park contains 372 acres, and commemorates General Washington's crossing of the Delaware with the Revolutionary Army, from Pennsylvania into New Jersey, on Christmas night 1776, preceding the Battle of Trenton.

305. The principal attraction is the park's historic significance. Continental Lane, over which the Revolutionary troops are reputed to have marched on that memorable night, extends nearly the full length of the park and is flanked on both sides by park drives. The McKonkey Ferry House, extant at the time of the crossing, now serves as a museum and the site of Bear Tavern, where the two columns of troops separated on their march to Trenton, is located within the park.(35) The average annual visitation of 490,000 finds easy access over State roads from the surrounding countryside and Pennsylvania. Approximately 75 percent of all visitors to the park reside in New Jersey. Pennsylvania residents contribute the next largest group and all States are represented in the annual visitor count.

306. Day outings for picnics constitute the prime attraction for an overwhelming majority of the visitors. Fishing in the Delaware is permitted; however, no facilities for swimming are provided because of the poor water quality.

STATE FORESTS

307. The Department of Conservation and Economic Development, through the Division of Planning and Development and the Bureau of Forestry, administers the State's forest lands.

308. New Jersey has ten State forests, with a total area of 60,327 acres, located in the least-developed sections of the State.

These forests are found in the northern mountain and lake region and the southern pine barrens. They serve as laboratories for forestry experiments and demonstrations of the many problems involved in wild-land use.

309. Although legislation designates that State forests are to be managed primarily for timber production, wildlife protection, conservation of water supplies, and watershed protection, recreation has emerged as the principal product of the State's forest land.

310. Eight State forests, with a total area of 56,177 acres, are located in the Delaware Basin and the included study area. Each of these forests has one or more developed recreation areas for day-use activities and/or camping. Each forest is open for hunting and fishing in accordance with New Jersey Fish and Game Laws.

Bass River State Forest (Included Study Area)

311. This forest of 9,270 acres is located in Burlington and Ocean Counties and is accessible directly from the Garden State Parkway and State highways. Recreation facilities provide for swimming, picnicking, hiking, hunting, and fishing. Vacation cabins and camp shelters are available. Average annual visitation is 76,000.

Belleplain State Forest

312. Located in the Coastal Plain region of Southern New Jersey in Cape May County, this 6,492-acre forest of mixed pines, oaks, and southern white cedar is accessible over State Route 47 and improved county roads.

313. Lake Nummy Recreation Area has a 26-acre lake for swimming, boating, and fishing. An excellent beach has been developed. A picnic area and bathhouse facilities are available for day-use. Approximately 56,000 visitors from surrounding counties, Camden, and Philadelphia, use the area annually.

314. East Creek Lake in the forest has a surface area of 65 acres but has not been developed for recreation use. A lodge building is available for group use and has accommodations for 16 persons.

Greenbank State Forest (Included Study Area)

315. This forest of 1,833 acres along the Mullica River in Atlantic and Burlington Counties is accessible over State Route 542 from the Garden State Parkway and U.S. 30. Most of this forest is a southern white cedar swamp and generally inaccessible for recreation. Along the Mullica River near the village of Green Bank, bathing facilities and picnic tables have been provided. Approximately 12,000 visitors use this area each year.

Jackson State Forest (Included Study Area)

316. Located in Ocean County 9 miles northwest of Lakewood, this 43-acre experimental forest is accessible over State Route 528, which



Vacation cabins are a feature of Stokes State Forest, New Jersey.



Camp shelters provide economical accommodations for vacation purposes. Bass River State Forest, New Jersey.

forms the north boundary. No recreation facilities are provided and hunting constitutes the only recreation use.

Jenny Jump State Forest

317. This forest of 967 acres is located in Warren County along the Jenny Jump Mountains, 8 miles northwest of Hackettstown. The only developed recreation area can be reached over improved county roads from the village of Hope.

318. Recreation facilities include five tent campsites, two camp shelters, and a picnic area. The absence of a usable water area precludes any extensive recreation use of this forest area.

319. Hunting is permitted in accordance with New Jersey Fish and Game Laws.

320. The metropolitan New York-New Jersey region is the origin of the greater percentage of forest users; however, Philadelphia, Trenton, and other urban centers in the vicinity contributes also to the 11,000 annual visitors.

321. Jenny Jump is a "dry forest", i.e., no water areas are available for recreation. This is the primary deterrent to recreation use of the area.

Lebanon State Forest

322. Located in Burlington County, this forest of mixed pines and oaks has an area of 22,185 acres and is easily reached from Camden and Philadelphia over State Route 70. Pakim Pond and Deep Hollow Pond Recreation Areas, with a combined area of 60 acres, provide limited recreation opportunities. Facilities include picnic and camping areas, vacation cabins, beach, and bathhouse. Approximately 95,000 visitors use these facilities annually. Overuse is evident.

323. Lebanon Forest is located on the divide between the Delaware River Basin and the New Jersey coastal drainage area and consequently does not receive sufficient drainage for the formation of large ponds or lakes, thus precluding extensive recreation use of this vast public reservation, except for hunting purposes. The present use of existing facilities far exceeds optimum conditions.

Penn State Forest (Included Study Area)

324. Located in the heart of the pine belt in Burlington County, this 2,958-acre forest affords views of New Jersey's "wilderness" and can be reached over county roads from State Route 72. Ninety-acre Lake Oswego has been developed from a cranberry bog. Facilities are available for swimming, picnicking, hiking, hunting, and fishing. Twenty-five thousand visitors use the area annually.

Stokes State Forest

325. Lying along the Kittatinny Mountains in Sussex County, 10

miles north of Newton, 12,429-acre Stokes State Forest joins High Point State Park to the north. U.S. 206 crosses the forest and constitutes the principal highway approach.

326. Recreation opportunities are varied and include facilities for day-use activities such as picnics, swimming, sports and games, hiking, and nature study. Nine-acre Lake Ocquittunk is the center of the principal recreation development, where, in addition to day-use facilities, rustic cabins and campsites are available for family units. An area for trailer camping is located near the lake.

327. There are more than 75 miles of roads and well-defined trails throughout the forest. The Appalachian Trail extends through the full length of the forest and into High Point State Park.

328. Hunting and fishing are permitted in accordance with New Jersey Fish and Game Laws.

329. Approximately 250,000 visitors are attracted to the forest annually for vacation and day outing purposes. Of this number, 90 percent are New Jersey residents, mostly from the metropolitan area adjacent to New York City.

FOREST-PARK RESERVATIONS

330. The forest-park reservations of New Jersey are two extensive land areas administered by the Department of Conservation and Economic Development. The ultimate purpose of these areas has not been determined except that multiple-use, including recreation, hunting, fishing, water conservation, and watershed protection, are assured.

Wharton Tract (State Forests and Parks - Undeveloped)
(Included Study Area)

331. The Wharton Tract is an area of 96,000 acres located in Burlington, Camden, and Atlantic Counties, in the south central section of New Jersey. In 1957, the tract was in the process of development in the Batsto vicinity, where a manorial farm and lake were being restored for visitor use.

332. The tract contains a wealth of recreation potential in the form of forests, wildlife, streams and lakes. Plans are being formulated for the best recreation and other use of this area and it has been estimated that 1,000,000 visitors can be accommodated annually after development. The significance of this area becomes apparent in view of the short distance (35 miles) from the heart of the Philadelphia metropolitan area.

Worthington Tract (State Forests and Parks - Undeveloped)

334. A tract of 6,200 acres has been acquired by the State of New Jersey in the vicinity of Delaware Water Gap, extending up the

Delaware River for a distance of 6 miles. Approximately 1 mile of the area borders on the river in the vicinity of the proposed Tocks Island dam site. U.S. 611 provides access to the area from New Jersey and Pennsylvania, and an improved county road parallels the river through the full length of the tract.

335. To date the area is undeveloped; however, limited use of organized groups is permitted for camping at primitive sites and fishermen are allowed to use the several streams on a day-use basis.

336. Plans are being formulated for the development of the tract for multiple-use recreation purposes.

PUBLIC SHOOTING AND FISHING GROUNDS

337. Within the Department of Conservation and Economic Development, the Division of Fish and Game was established "for the purpose of providing an adequate and flexible system of protection, propagation, increase, control, and conservation of fresh water fish, game birds, game animals and fur-bearing animals in this State, and for their use and development for public recreation and food supply". (36)

338. Under the provisions of this Act, the State operates 33 public shooting and fishing grounds with a total of 87,027 acres in the Delaware River Basin and the included study area. In addition to hunting and fishing, other forms of nonurban recreation are pursued.

339. The public shooting and fishing areas of New Jersey are maintained and operated for purposes directly associated with those activities; however, other types of nonurban recreation are permitted and encouraged.

HISTORIC SITES

340. The Historic Sites Section in the Bureau of Parks and Recreation administers the State-owned historic areas. This Bureau now administers a total of eighteen historic sites throughout the State and more than one hundred roadside markers.

341. There are six State-maintained and operated historic sites within the Basin and large number of roadside markers. The historic buildings are open to the public.

Hancock House

342. This fine example of the architecture of Southern New Jersey is located at Hancock's Bridge. Built in 1734, this two-story structure has blue glazed header bricks, laid in patterns to form a zig-zag design on the end of the building. As was typical of that era, the house also contains the date of erection and initials of the builder in brick on the end wall.

343. It was the home of William Hancock, a Judge of the Courts of Salem and an assemblyman from 1733 to 1751. Hancock was killed in his home during the Battle of Hancock's Bridge on March 21, 1778 when the British attacked and massacred a number of the militia troops guarding the bridge.

Oxford Furnace

344. Located in the town of Oxford in Warren County, this charcoal blast furnace was built in 1741-1742 and was blown out in 1884. It supplied cannon balls for American Troops during the French and Indian, Revolutionary and Civil Wars. It was the first furnace in America to make use of the hot blast. There are no visitor services or facilities available.

345. This historic site is of significance to the State in relation to the development of the iron industry in New Jersey and the association of the furnace with colonial wars. Presently, the site is in a state of progressive deterioration. Through stabilization and interpretive devices, this site could be made into a valuable point of interest.

Somers House (Included Study Area)

346. Located in Atlantic County just east of the Garden State Parkway, this historic site is the birthplace of Lieutenant Commander Richard Somers, III who distinguished himself in the early history of the United State Navy in the Battle of Tripoli in 1804. The mansion was built in 1720-30 and is now furnished with antiques and relics.

COUNTY AREAS - NEW JERSEY

347. Only five of the Basin counties in New Jersey administer recreation lands of any type and only two of these have an organized park or recreation department. The 22 separate areas are more urban in character than nonurban and 15 of this number are located in highly urban Camden County. With one exception, these county parks are local in interest and cater to the immediately surrounding communities. Ocean County Park is the exception in that visitors are attracted from neighboring Monmouth County where no park or recreation area exists.

ATLANTIC COUNTY

348. None

BURLINGTON COUNTY

349. None

CAMDEN COUNTY

350. The Camden County Park Commission administers 15 parks with a conbined area of 4,000 acres. Six of these parks are located within

the city and the remainder are in the suburban areas of the county. The theme of these parks is conservation centering about sports, fishing, boating, tennis, picnics and other outdoor activities. Although not falling within the nonurban classification, these parks do contribute materially toward fulfilling the need for open space activities in this highly urbanized county.

CAPE MAY COUNTY

351. A total of 37 acres in two areas are administered by the Board of Chosen Freeholders. Tracts of 25 acres and 12 acres, respectively, have been developed from county-owned lands at the County Airport and the County Farm. Facilities for picnics and field sports are provided.

CUMBERLAND COUNTY

352. None

GLOUCESTER COUNTY

353. Red Bank Battlefield Park is administered by the Board of Chosen Freeholders although the land is owned by the Federal Government. The park contains a dry moat, several cannons, and monuments that mark the battlefield site. Within the park is the Whitall House (1748) which was struck by gunfire during the Battle of Redbank.

354. The park contains 20 acres.

HUNTERDON COUNTY

355. None

MERCER COUNTY

356. The Mercer County Recreation Commission expects to have 289 acres of land dedicated to recreation purposes by the end of 1959. In 1958 only 6 acres had been developed and plans had been made for the development of a 200-acre tract.

MONMOUTH COUNTY

357. None

OCEAN COUNTY

358. A total of 303 acres of park land is administered by the Board of Chosen Freeholders. Ocean County Park, with an area of 300 acres, is a former estate of the late John D. Rockefeller and attracts visitors from surrounding counties, particularly Monmouth County which has no park or recreation area. Two small lake beach areas, with a

combined area of 3 acres, have facilities for swimming and picnics.

SALEM COUNTY

359. None

SUSSEX COUNTY

360. None

WARREN COUNTY

361. None

COMMERCIAL DEVELOPMENTS - NEW JERSEY

362. Commercial recreation developments in New Jersey are concentrated primarily in the seashore counties and to a lesser degree in the northwest lake region of the State. Atlantic County is far out in front as the largest resort center, followed by Cape May, Ocean, and Monmouth Counties along the seashore. The lake region of the State embraces Sussex and Warren Counties within the Basin.

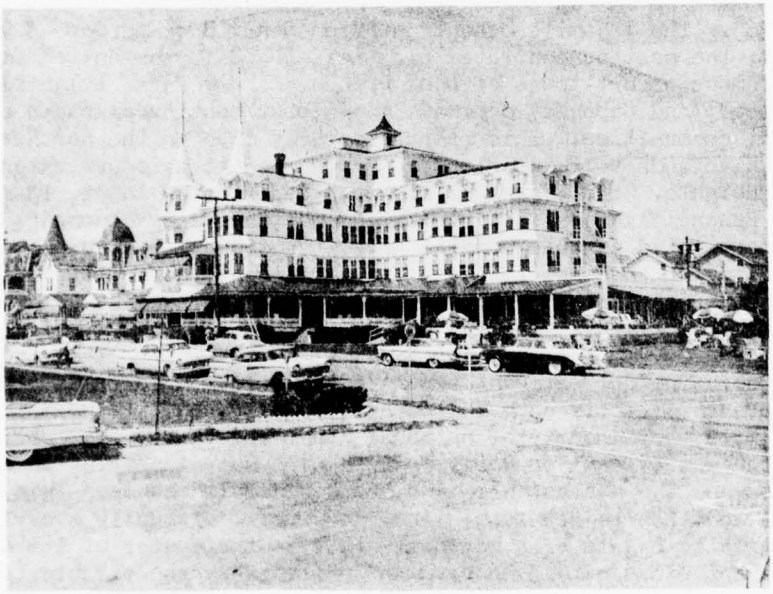
363. The 125-mile beachfront from Sandy Hook to Cape May is, no doubt, the most concentrated playtime strand in the United States. The famous resort towns of Long Branch, Asbury Park, Atlantic City, Wildwood, and Cape May dominate the almost continuous chain of seaside resort communities. This is particularly true in the northern segment from Highlands to Point Pleasant Beach, and to a lesser extent to Seaside Heights. From Barnegat Light to Beach Haven Inlet, 13-mile long Long Beach Island is fast becoming a continuous development. The southern third of this coastal area is somewhat less consolidated; however, several communities comprise Greater Atlantic City, and the four Wildwoods make up the Wildwood area. Cape May remains as a community apart.

364. The recreational opportunities offered for sale along "the shore" are directly opposed to the sedate tranquility normally associated with the serenity of national and state parks. Attractions here run the gamut from horse racing with pari mutuel betting to diving horses and the hottest jazz and "rock and roll" bands. This, of course, is in addition to sea, sun, sand, and surf. Virtually every settlement of any size boasts of a boardwalk that is the center of its attractions. Amusement piers extend seaward and offer every conceivable type of "canned" pleasure. The boardwalk is lined with hotels, rooming houses, stores of every description, movie and burlesque theaters, and salt water taffy shops. Commercialization of the New Jersey seashore is virtually complete.

365. Atlantic City (14) is in a class by itself. It combines the convenience and culture of metropolitan life with carefree, timeless



Atlantic City dominates the New Jersey seashore.



Cape May still has some of the subdued and refined qualities that characterized the resort in the days before the turn of the century.

leisure. Built on an island, the city has a beach and a back bay, a boardwalk, and boat piers. It has skyscrapers and cabanas, airports and bicycles, seafood and hot dogs, ticker tape and timetables, fashion parades and water skiing. It is the metropolitan host in the grand manner. It has huge hotels and a convention hall large enough to house the entire resident population. Resort facilities are available in every season of the year, and promotions are geared to every holiday of the calendar. Overnight accommodations with push-button service are in abundance and do-it-yourself housekeeping units are also available. Room accommodations of all kinds are sufficient to take care of 100,000 guests. Motels, once frowned upon, have made their appearance in recent years. Their number has multiplied rapidly, and the accommodations offered are on par with those available in the boardwalk skyscraper hotels.

366. The entire seashore of Cape May County is a broken chain of little islands separated from the mainland. On the map, these islands resemble crumbs of all sizes and shapes, brushed off the tableland. Almost the entire insular formation is a resort land. The City of Cape May on the southern tip of the peninsula; Wildwood, a short distance to the north; and Ocean City, whose residents can see the skyscrapers of Atlantic City across Great Egg Harbor, are the principal resort centers of Cape May County.

367. Compared with some of the other resorts, Cape May still has some of the subdued and refined qualities that characterized the resorts in the days before the turn of the century. The hotels have the dignity and charm and grace that go with age. To this day, rest and recreation are interspersed with social activity, but it is never conspicuous, it is always "proper" and "quiet".

368. Wildwood, just a short spin up the ocean drive, goes in for more of the excitement and gaiety of amusement rides and nightlife; and for daytime hours it offers the most expansive beach of the New Jersey shore. After dark, the night clubs take over and it is alleged that Wildwood has more clubs and taverns than any other spot on the coast. As in other seashore resorts, rooming accommodations are at a premium at the height of the season.

369. Ocean City is predominately a "family resort". Guests, including children, arrive in the family car and bring the family habits of living with them. Games of chance and alcoholic beverages are prohibited, and the usual workday business ventures are not a part of Sunday activity. Sunday evening church services move into the boardwalk theaters and the boardwalk shops and places of amusement, open all week, take their rest on the Sabbath.

370. A large portion of Cape May County's visitors choose to rent cottages or apartments. Only in Wildwood are rooming accommodations fairly important. This division is consistant with the general pattern observed all along the shore - the larger the resort, the higher the proportion of accommodations in rooms in contrast to housekeeping units.

Visitors who remain only a short time prefer a room to a housekeeping unit. Vacationers planning a long stay often seek a small, quiet resort; the short trip or visit is more likely to have as its destination a large resort with a variety of amusements and activities. Therefore, the large resort needs rooms and the small resort needs housekeeping units.

371. Ocean County has a large number of privately-owned cottages and quite a few rental units. This community complex changes the nature of the resort area to a large extent. There is a minimum of commercial activity and very little party atmosphere. Suburban living is transplanted for the summer with the emphasis placed on quiet cottage vacationing.

372. Long Beach Island, from Barnegat Light to Beach Haven, has a variety of resort communities and still more resorts have developed further up the New Jersey shore from Seaside to Point Pleasant. None is large, but great is the variation from the carnival atmosphere of Seaside Heights to the large summer homes of Bay Head and Mantoloking. Inland is Lakewood, one of the few winter resorts of New Jersey.

STATE AREAS - NEW YORK (See Table 8 following page 68)

373. In the State of New York, the Conservation Department, through the Division of Parks, the Division of Lands and Forests, and the Division of Fish and Game, administers State-owned lands devoted to or used in part for nonurban recreation purposes.

STATE PARKS

374. The Division of Parks does not administer any land area within the New York portion of the Delaware River Basin.

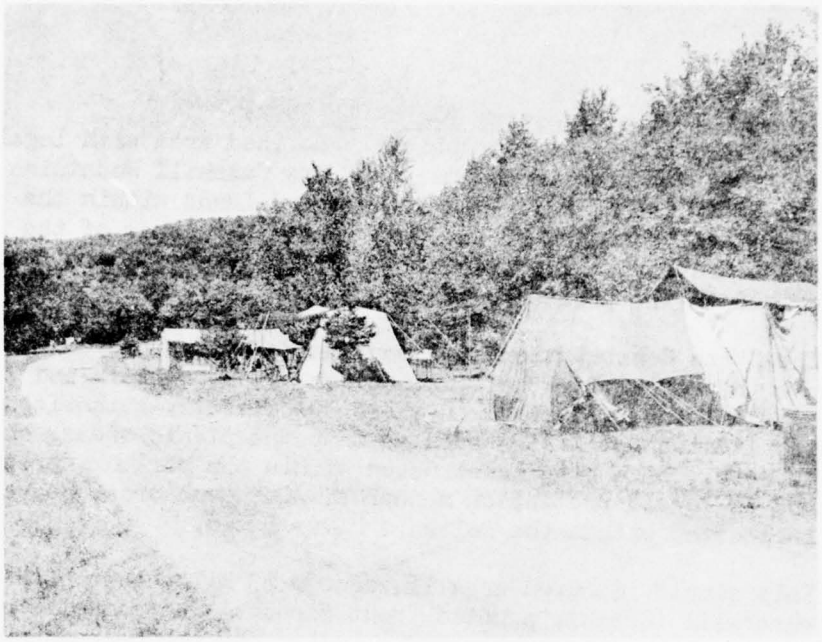
FOREST PRESERVES

375. The Division of Lands and Forests has custody and control over the forest preserves, parks, and other State lands in the sixth park region and may establish, acquire and manage other State parks and parkways in the forest preserve counties.(37)

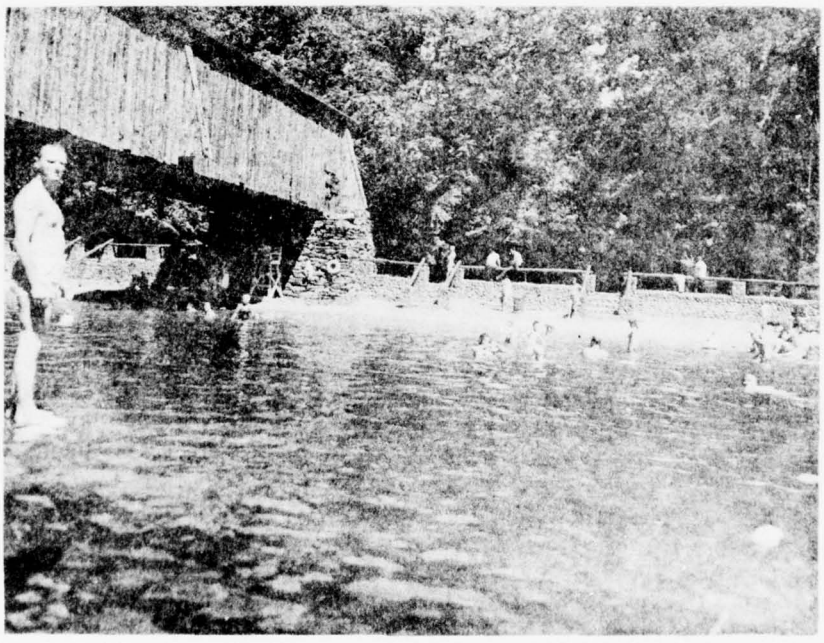
376. The present and future use of forest preserve land is specified in the State Constitution as follows: "The lands of the State now owned or hereafter acquired, constituting the forest preserve as now fixed by law, shall be forever kept as wild lands. They shall not be leased, sold or exchanged or taken by any corporation, public or private, nor shall the timber thereon be sold, removed or destroyed. Nothing herein contained shall prevent the State from constructing, completing and maintaining any highway heretofore specifically authorized by constitutional amendment, nor from constructing and maintaining "ski trails as specifically described".(38)

RECREATION AREA	COUNTY	AREA (acres)	ADMINISTRATIVE AGENCY	PRINCIPAL ATTRACTION	RECREATION ACTIVITIES: DAY-USE	VACATION	WINTER	SUMMER	CAMPING	PICNICS	SWIMMING	PLAYFIELD	BOATING	HIKING	WINTER SPORTS	HUNTING	FISHING	MUSEUM	OVERNIGHT ACCOMMODATIONS: HOTEL OR LODGE NO.	HOTEL OR LODGE CAP.	FAMILY UNIT CABINS NO.	FAMILY UNIT CABINS CAP.	TENT OR TRAILER CAMPSITES NO.	GROUP CAMPS NO.	GROUP CAMPS CAP.	AVERAGE ANNUAL VISITATION 5 YEARS PRIOR 1957
NEW JERSEY (87)																										
FEDERAL AREAS (2)																										
National Wildlife Refuges (2)																										
Brigantine	Atlantic	15,942	U.S.D.I. Fish and Wildlife Service	Migratory Waterfowl	X	-	X	X	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-
Killcohook	Salem	1,362	- do -	- do -	X	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		17,304																								
STATE AREAS (61)																										
State Parks (15)																										
* Allaire	Monmouth	1,170	Dept. of Conserv. and Econ. Devel.: Forests and Parks Section	Historic Iron Making Village	X	-	-	X	-	X	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	2,378
* Barnegat Lighthouse	Ocean	12	- do -	Historic Lighthouse and Ocean	X	-	X	X	-	X	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	56,614
Cranberry Lake	Sussex	199	- do -	Forest and Lake	U	N	D	E	V	E	L	O	P	E	D				-	-	-	-	-	-	-	-
Fort Mott	Salem	104	- do -	Military Fortifications	X	-	X	X	-	X	X	-	-	-	-	-	X	-	-	-	-	-	-	-	-	82,052
High Point	Sussex	10,935	- do -	Mountains, Forest & Lakes	X	X	X	X	X	X	X	-	X	X	-	-	X	-	-	1	53	2	12	50	-	-	382,180
Hopatcong	Sussex	107	- do -	Lake	X	-	-	X	-	X	X	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	262,216
* Island Beach	Ocean	2,200	- do -	Ocean Beach	X	-	X	X	-	X	X	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	47,250
* Mount Laurel	Burlington	20	- do -	Woodland	U	N	D	E	V	E	L	O	P	E	D				-	-	-	-	-	-	-	-
Musconetcong	Sussex	343	- do -	Lake	X	-	X	X	-	-	X	-	X	-	X	-	X	-	-	-	-	-	-	-	-	-	41,176
Parvin	Salem	1,025	- do -	Forest and Lake	X	X	X	X	X	X	X	-	X	X	-	-	X	-	-	-	-	16	64	21	-	-	182,534
Princeton Battlefield	*Mercer*	40	- do -	*Revolutionary Battlefield*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stephens	Warren	222	- do -	Woodland and River	X	-	-	X	-	X	X	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	97,836
Swartswood	Sussex	704	- do -	Lake	X	-	X	X	-	X	X	-	X	-	X	-	X	-	-	-	-	-	-	-	-	-	98,442
* Voorhees	Hunterdon	429	- do -	Forest and Streams	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26,455
Washington Crossing	Mercer	372	- do -	Historic Site	X	-	-	X	-	X	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	490,810
		17,882																								
State Forests (8)																										
* Bass River	Burlington	9,270	- do -	Pine Forest and Lake	X	X	X	X	-	X	X	-	X	X	-	X	X	-	-	-	-	14	84	-	-	-	76,192
Belleplain	Cape May	6,492	- do -	Pine Forest and Lake	X	-	X	X	-	X	X	-	-	X	-	X	X	-	-	-	-	-	-	-	1	16	56,526
* Greenbank	Burlington	1,833	- do -	Pine Forest and River	X	-	X	X	-	X	X	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	11,314
* Jackson	Ocean	43	- do -	Experimental Forest	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Jenny Jump	Warren	967	- do -	Hardwood Forest	X	X	-	X	X	X	-	-	-	X	-	X	-	-	-	-	-	-	-	7	-	-	11,690
Lebanon	Burlington	22,185	- do -	Pine Forest and Ponds	X	X	X	X	X	X	X	-	-	X	-	X	X	-	-	-	-	3	12	6	-	-	95,708
* Penn	Burlington	2,958	- do -	Pine Forest and Lake	X	-	X	X	-	X	X	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	25,004
Stokes	Sussex	12,429	- do -	Hardwood Forest and Lake	X	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	-	13	64	22	-	-	253,152
		56,177																								
Forest-Park Reserv. (2)																										
* Wharton Tract	Atlantic, Camden & Burlington	96,000	- do -	Forest, Lakes, Streams Historic	U	N	D	E	V	E	L	O	P	E	D				-	-	-	-	-	-	-	-
Worthington Tract	Warren	6,200	- do -	Forest, Lake, Delaware River	U	N	D	E	V	E	L	O	P	E	D				-	-	-	-	-	-	-	-
		102,200																								
Public Hunting and Fishing Grounds (33)																										
2 Areas	Atlantic	9,602	Division of Fish & Game	Hunting and Fishing	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-
1 Area	Burlington	214	- do -	Hunting	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
3 Areas	Camden	2,113	- do -	Hunting and Fishing	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-
3 Areas	Cape May	4,485	- do -	- do -	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-
7 Areas	Cumberland	30,698	- do -	- do -	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-
1 Area	Gloucester	2,337	- do -	Hunting	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
2 Areas	Hunterdon	1,019	- do -	Hunting and Fishing	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-
1 Area	Monmouth	1,500	- do -	Hunting	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
6 Areas	Ocean	26,767	- do -	Hunting and Fishing	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-
1 Area	Salem	1,800	- do -	- do -	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-
5 Areas	Sussex	6,372	- do -	- do -	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-
1 Area	Warren	140	- do -	Hunting	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
		87,027																								
Historic Sites (3)																										
Hancock House	Salem	1	Bur. of Historic Sites	Revolutionary War History	X	-	X	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	3,895
Oxford Furnace	Warren	1	- do -	Colonial Iron Furnace	X	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Somers House	Atlantic	-	- do -	Historical Home	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
		2																								
COUNTY AREAS (24)																										
County Parks (4)																										
15 Parks	Camden	4,000	Camden County Park Comm.	Urban Park Facilities	X	-	X	X	-	X	X	X	X	X	-	X	-	-	-	-	-	-	-	-	-	-	-
2 Parks	Cape May	37	Bd. Chosen Freeholders	Picnic Facilities	X	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1 Park	Gloucester	20	- do -	Revolutionary Battlefield Site	X	-	X	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	1,146
3 Parks	Mercer	289	Mercer Co. Rec. Comm.	Forest, Play Areas	X	-	-	X	-	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3 Parks	Ocean	303	Bd. Chosen Freeholders	Swimming, Picnics, Play Area	X	-	X	X	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		4,649																								
		285,241																								

* Located in the included study area



Vacation Camping. Beaver Kill Campsite, Catskill Park, New York.



Swimming hole under the old covered bridge, Beaver Kill Campsite, Catskill Park, New York.

Catskill Forest Preserve (Catskill Park)

377. Catskill Park is a geographically-defined area with legally-defined boundaries and lies in the heart of the Catskill Mountains directly west of Kingston, N.Y. The State-owned lands within the "blue line" or legal boundary of the park constitute lands of the Catskill Forest Preserve. The present and future use of these lands are as described in the preceding paragraph.

378. The State Constitution has been amended and approved by vote of the people to provide for the construction of ski centers and 70 miles of ski trails. In addition to these specifically authorized ski developments, limited facilities such as camp and picnic areas, shelters, trails, etc., have been constructed within the park for forest preserve land as forest protection measures. One such area, Beaverkill Campsite, is located within the Delaware River Basin.

379. This single improved area is located 23 miles east of Hancock, N.Y., on Beaverkill (Creek), a noted trout stream. The campsite has facilities for camping, picnicking and swimming and can be reached from State Route 17 over a paved county road. A total of 41,000 visitors used the area during 1956.

380. Approximately 40 percent of this 234,610-acre wilderness forest preserve lies within the Delaware River Basin. The present use of this publicly-owned area is infinitesimal in proportion to the recreation use which the area could carry without the loss of any park or forest values. The area possesses outstanding qualities for non-urban recreation purposes.

GAME MANAGEMENT AREAS

381. The Conservation Department, through the Division of Fish and Game, is responsible for the management and control of public hunting and fishing grounds owned, operated, or acquired by the State. The Department has authority to acquire by lease, purchase, gift, devise, agreement, or otherwise from any source, lands, waters, or lands and waters, or any rights or interests therein for the purpose of establishing and maintaining public hunting, trapping, and fishing grounds.

382. There is one game management area located in the New York portion of the Basin. This single area is in Delaware County and is administered primarily for hunters and fishermen and has primitive facilities for these and associated activities such as camping and picnicking. Approximately 11,000 visitors use the area annually.

383. In addition to this hunting area, 57 miles of stream easement 33 to 66 feet wide are available to anglers. These public fishing areas provide improved fish habitat, access trails, and parking areas for fishermen and receive heavy fishing pressures.

COUNTY AREAS - NEW YORK

DELAWARE COUNTY

384. None

SULLIVAN COUNTY

385. The Sullivan County Board of Supervisors administers Minisink Battlefield Park, a 6-acre area near the village of Minisink Ford on the Delaware River. The park commemorates the battle that took place on the site during the Revolutionary War. A monument dedicated to the patriots who died here constitutes the sole improvement.

386. Plans have been prepared to improve and enlarge this memorial park. The area is unsuited for other than local use.

COMMERCIAL DEVELOPMENTS - NEW YORK

387. Commercial recreation developments in the New York portion of the Basin are centered in the Catskill Mountain region of Delaware, Sullivan, and Ulster Counties. In the Catskills, emphasis is placed on vacation accommodations centered around a hotel or lodge. Many of these resorts are self-contained developments catering to every wish and whim of guests. Recreation facilities such as golf courses, tennis courts, swimming pools, lake developments, boat basins, ski runs with lifts, riding stables, miniature golf, croquet and handball courts, ballfields, and similar activities provide daytime recreation. Evening entertainment often consists of dancing to "name bands" and shows featuring Broadway, Hollywood, and television celebrities. The serving of fine food is considered a "must" for the successful operation of the more exclusive resorts where nationally-and internationally-known chefs prepare selected delicacies. This type of establishment is not universal throughout the Catskills; however, it is the general pattern. Each commercial development endeavors to fulfill the needs and desires of its guests. A complete range of accommodations exists from the very expensive plush hotels, with the ultimate in luxurious comfort, to vacation farms where summer guests find relaxation in assisting the farmer with his daily chores.

388. This resort center is just 2-hours driving time over superhighways from Times Square. The counties have a resident population of 40,000 and a seasonal turnover of more than 600,000. Vacationers are attracted to the area by 385 resort hotels, 27,000 family rental cottages, 350 rooming houses, 15 motels, and 5,000 privately-owned summer cottages. During 1957, a total of 603,000 visitors were accommodated in these facilities.(39)

389. Although the Catskill region is renowned for its lakes and streams and good fishing, hunting, boating, and skiing, the great majority of the visitors to the region seem to prefer the organized

social activities of the big resorts. "Most Sullivan (County) vacationists are so busy enjoying the fun laid out for them on the premises that they rarely get around to the most scenic parts of the County, and they don't know what they are missing".(40)

390. The Catskills have been a summering place for nearly a century, particularly for New Yorkers who constitute approximately 95 percent of the total visitation. The peak season between Memorial Day and Labor Day has been extended on both ends by many resorts through the installation of winter attractions and facilities for skiing, skating, tobogganing, etc., so that numerous resorts in the area remain open throughout the year.

STATE AREAS - PENNSYLVANIA (See Table 9 following page 81)

391. Within the State of Pennsylvania, nonurban State owned recreation lands are administered by the Department of Forests and Waters, the Department of Property and Supplies, the Game Commission, the Fish Commission, and the Historical and Museum Commission. All State forests and State parks, except those administered by separate commissions or departments, are under the jurisdiction of the Bureau of Forests and the Division of State Parks, respectively. The Game Commission supervises public hunting grounds and game refuges as well as other matters relating to wildlife within the State. The Fish Commission has cognizance of fish matters and maintains a system of public fishing areas and access points to streams and water areas for the use of the public. The Historical and Museum Commission is the State's custodian of historical buildings, military markers and monuments, and objects of historic interest.

392. In the Pennsylvania portion of the Delaware River Basin, the State has set aside 13 State parks, 1 State forest, 29 State game land areas, 8 public fishing areas, and 4 historic sites, all of which are located in the nonurban areas of the Basin.

STATE PARKS

393. The Department of Forests and Waters (41), through the Division of State Parks, has supervision and control of all State parks in the Delaware River Basin, except Washington Crossing, Brandywine Battlefield, and Valley Forge, each of which is supervised by a park commission. The Secretary of Forests and Waters is an ex-officio member of each commission.

394. The Department is empowered to acquire lands to be maintained and utilized as State parks for the purpose of promoting healthful outdoor recreation and education and making available such natural areas of unusal scenic beauty, especially those which provide impressive views, waterfalls, gorges, creeks, caves, or other unique and interesting features. The design and construction of public facilities and conveniences for the transportation, shelter, comfort, and education

RECREATION AREAS	COUNTY	AREA (acres)	ADMINISTRATIVE AGENCY	PRINCIPAL ATTRACTION
NEW YORK (3)				
STATE AREAS (2)				
Forest Preserve (1)				
Catskill Park	Ulster, Sullivan, Delaware and Green	234,610	Conservation Dept, Division of Lands and Forests	Forest, Streams, Wilderness Areas
Game Management Areas (1)				
1 Area	Delaware	-	Division of Fish and Game	Hunting
COUNTY AREAS (1)				
Historic Site (1)				
Minisink Battlefield	Sullivan	6	Sullivan County	Site of Indian Battle 1779
		234,616		

URBAN RECREATION AREAS

NEW YORK

PRINCIPAL ATTRACTION	RECREATION ACTIVITIES															OVERNIGHT ACCOMMODATIONS								AVERAGE ANNUAL VISITATION 5 YEARS PRIOR 1957
	DAY-USE	VACATION	WINTER	SUMMER	CAMPING	PICNICS	SWIMMING	PLAYFIELD	BOATING	HIKING	WINTER SPORTS	HUNTING	FISHING	MUSEUMS		HOTEL or LODGE		FAMILY UNIT CABINS		TENT OR TRAILER CAMPSITES	GROUP CAMPS		
																NO.	CAP.	NO.	CAP.	NO.	NO.	CAP.	
Forest, Streams, Wilderness Areas	X	X	-	X	X	X	X	-	-	X	-	X	X	-	-	-	-	-	-	54	-	-	34,152
Hunting	X	-	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	11,000
Site of Indian Battle 1779	X	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	- -

TABLE 8

2

of the people is to be in such a manner as to preserve the naturalistic appearance of State park areas, surrounding and approaches.

395. There are 13 State parks with a total of 34,526 acres in the Pennsylvania portion of the Delaware River Basin. These areas are fairly well distributed with regard to population centers and offer opportunities for day outing activities, tent camping, and vacationing in rustic cabins, all within reasonable driving time from any point within the Basin.

Big Pocono State Park

396. Overlooking the entire Pocono Plateau, this 1,305-acre State park on Camelback Mountain offers outstanding scenic views of the countryside from an elevation of 2,100 feet. The park is located in Monroe County, 9 miles northwest of Stroudsburg and is accessible from U.S. 611 over a State road that leads to the top of the mountain.

397. The outstanding attraction is the view from the mountain top. A scenic drive makes available views in all directions for the motorist. Picnic facilities are provided and hunting is permitted. Approximately 100,000 persons visit the park annually.

Brandywine Battlefield Park

398. This 50-acre park, located on a rolling hillside overlooking Brandywine Creek and adjacent to U.S. 1 at a point 25 miles west of Philadelphia, is administered by the Department of Property and Supplies through the Brandywine Battlefield Commission.

399. The principal attractions in the park are the reconstructed and restored headquarters of Generals Washington and Lafayette. Some of the outbuildings have been restored to recreate the farmstead atmosphere of the Revolutionary period.

400. Approximately 28,000 persons visit the park annually. This figure represents only those visitors who actually visit the houses and does not include picnickers who use the park for that purpose only.

Fort Washington State Park

401. This State park, consisting of 493 acres in five detached parcels, is located 12 miles northwest of Central Philadelphia. The park is divided by the Pennsylvania Turnpike and is reached from Philadelphia via U.S. 309. Philadelphia residents constitute 70 percent of the park visitors.

402. The earthworks that constituted the original Fort Washington have been reformed and the surrounding area is maintained as a semi-formal park. The fort occupies a hill crest that affords views of the Pennsylvania Turnpike and the surrounding suburban areas.

403. The Flourtown tract has been highly developed as a day-use area for picnics and sports activities. A good flow of water runs

through this area; however, pollution precludes any recreation use of the stream.

404. The Militia Hill tract is currently used as a primitive camping area and receives considerable use by scout groups. Extensive park development is now underway in this area.

405. Fort Washington State Park is primarily of local interest and is used by the urban and suburban residents of the greater Philadelphia area.

French Creek State Park

406. Located 14 miles southeast of Reading and 40 miles northwest of Philadelphia, this 5,933-acre park was originally developed by the National Park Service as a Recreation Demonstration Area and was turned over to the State of Pennsylvania in 1946 for State park purposes. The park now receives more than 1,000,000 visitors each year, most of whom come from the Philadelphia area.

407. The park is well situated in rolling hills of hardwoods and has one 65-acre lake for recreation use and a smaller one for fishing only. The larger lake is the principal attraction in the park and the focal point of all recreation use. Swimming is the most popular activity. Year-round group camping is an important feature of the park use. Day-use facilities include picnic areas, bathing beach and bathhouses, playfields, and hiking trails. Family camping is a popular park activity and many visitors from the surrounding cities spend their vacations in the area. Hunting is permitted on 2,000 acres of park land.

408. Access to the park is easily had over hard-surfaced roads. The Pennsylvania Turnpike runs just south of the park, U.S. 422 and 122 are on the north and west sides and State Route 100 is on the east side.

George W. Childs State Park

409. This 281-acre State park, located in the Eastern Pocono section of Pike County, 21 miles northeast of Stroudsburg, is served by a paved State road connection with U.S. 209 and Dingman's Ferry.

410. The principal feature of the park is a rugged ravine with hemlock covered hillsides. Approximately 75,000 visitors use this park annually for day outings. Picnic facilities are the only recreation development present.

411. Tentative plans have been prepared for the development of recently acquired land. Expansion of picnic facilities and the installation of a bathing area on Dingman's Creek are possible new developments. These improvements will enhance the day-use capacity of the park.

Gouldsboro State Park

412. This 2,800-acre park in Monroe and Wayne Counties is the product of the combined efforts of the Department of Forests and Waters and the Pennsylvania Fish Commission. Having recently acquired title to Gouldsboro Lake, the Fish Commission leased to the Department of Forests and Waters an extensive shoreline area and in this manner made possible the construction, by the Department of Forests and Waters, of a fine beach and swimming area, boat launching ramp, picnic areas, parking lots, and access road.

413. This new State park, located on U.S. 611, is located midway between Scranton and Stroudsburg.

Hickory Run State Park

414. This 13,386-acre park in Carbon County was developed by the National Park Service as a Recreation Demonstration Area and was turned over to the State as a State park in 1946. It is centrally located with respect to urban areas in Pennsylvania's eastern coal and steel section and is 72 miles north of Philadelphia.

415. The northeast extension of the Pennsylvania Turnpike, Philadelphia to Scranton, passes directly through the park and the Pocono Interchange is located just outside the northern boundary. This high-speed, limited-access highway has brought the park to within 1½ hours' driving time from Philadelphia. Visitation has increased materially since the opening of this highway.

416. State Route 940 provides access from the east and west and was the primary access route prior to the opening of the Turnpike.

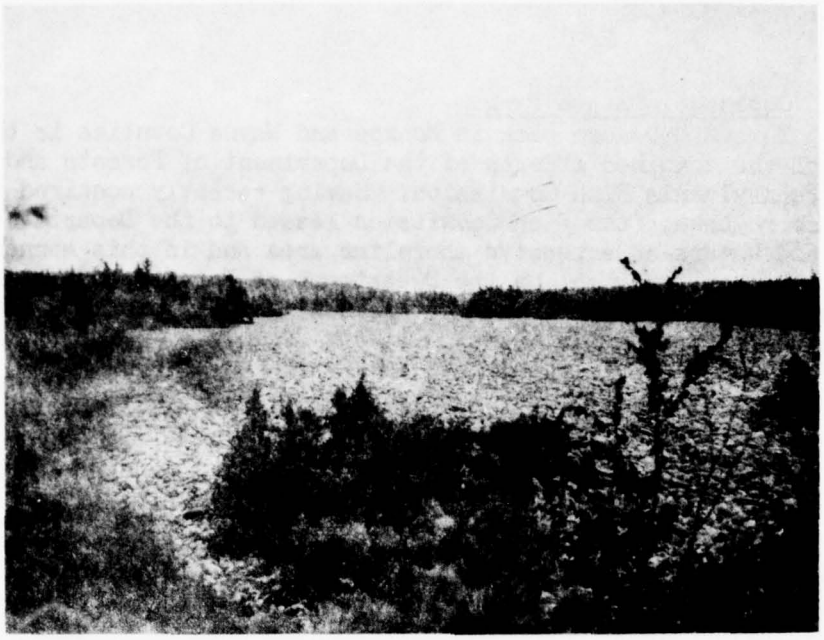
417. The park is located in a heavily-forested section of the glaciated Pocono Plateau. The extremely thin, rocky soil, leads to difficulties in providing recreation facilities. However, evidence of glacial action is an outstanding feature of the park and a 30 acre boulder field is thought to be one of the most unusual glacial phenomenon in the country. Other attractions include streams, waterfalls, forest, and wildlife.

418. Approximately 350,000 visitors are attracted to the park annually for vacation, weekend, and day use activities. Facilities are provided for tent and trailer camping, and day-use picnicking and swimming. The cool nights and warm days have proven to be a large factor in the heavy use of the park.

419. Hunting is allowed on 13,000 acres of park land and fishing is a popular activity.

Promised Land State Park

420. Located on the glaciated Pocono Plateau, this 2,328-acre park has good access over State Routes 290 and 390 from Stroudsburg, 20 miles to the south.



The Boulder Field, a lake of glacial stones, is a feature of Hickory Run State Park, Pennsylvania.



Hopewell Lake swimming area, French Creek State Park, Pennsylvania.

421. The outstanding feature of the park is the 422-acre Lake about which all recreation activities are centered. Developed facilities include three camping areas, vacation cabins and a day-use area with picnic and swimming facilities.

422. Approximately 400,000 visitors, principally from Philadelphia, Trenton and the counties surrounding the park, use the area annually.

Ralph Stover State Park

423. This 44-acre park, located in a gorge along Tohickon Creek in Bucks County, 27 miles north of Philadelphia, is readily accessible over U.S. 611 from Philadelphia or scenic State Route 32. The park is 1 mile upstream from the Delaware River.

424. Recreation facilities include six vacation cabins, and picnic and swimming areas. Approximately 100,000 visitors from the Philadelphia, Trenton, and Bethlehem areas use the park annually.

425. The outstanding features in the park are the rocky creek gorge and the picturesque hemlock slopes.

Roosevelt State Park

426. Located in Bucks and Northampton Counties along the Delaware River, this 600-acre State park preserves a 60 mile section of the Delaware Canal. The park consists of the canal, tow-path and associated locks, and canal structures.

427. This park, with an average width of 40 feet, is used for swimming, canoeing, fishing, riding, hiking, picnicking, and ice skating. Barge trip parties are scheduled during the summer months. Approximately 70,000 persons visit the park annually.

428. This park is an example of what can be done with the physical remains of a bygone era. The historic aspects of canal transportation are preserved for 20th century visitors. The significance of this park is not the number of people who can be accommodated but the preservation of the historic scene.

Tobyhanna State Park

429. Located in the Monroe County near the summit of the Pocono Plateau, this 7,500-acre State park is served by U.S. 611 from Scranton and Stroudsburg.

430. Tobyhanna Lake is the principal feature and the center of recreation activities. Only day-use facilities for picnicking, swimming, and boating are available to visitors. Camping facilities have not been provided; however, current plans include areas for tent and trailer purposes.

431. Approximately 63,000 visitors from the surrounding industrial

cities, New Jersey, and vacationers in the Pocono area use the park annually.

432. Hunting is permitted outside of developed areas.

Valley Forge State Park

433. Within the 2,033 acres of Valley Forge State Park is preserved the winter encampment scene of the American Continental Army from December 17, 1777 to June 19, 1778 and it is probably the most widely-known geographical area referred to in the United States history. Valley Forge has long been a mecca for visitors from all parts of the United States, as attested by an average annual visitation of 2,400,000 since 1951.

434. The historical significance of the area, plus cultural features such as the National Memorial Arch, the Washington Memorial Chapel and bell tower, Washington's Headquarters, reconstructed soldier's huts, museums, restored earthworks, fortifications, monuments, and statues constitute the principal attractions in the park. The spring flowers, particularly the eastern dogwood, attract many thousands of visitors to the park in April and May.

435. Picnic facilities and playfields are available for day-use activities. A small camp and trailer area is maintained for overnight visitors. Valley Forge has twice been the scene of the National Boy Scout Jamboree. More than 50,000 scouts were present on each occasion.

436. The park is surrounded by excellent highways, the Pennsylvania Turnpike is just outside the park, and U.S. 30, 202, and 422 provide ready access to the area. State Route 43 from Philadelphia leads directly to the park and State Route 23 runs through the area.

Washington Crossing State Park

437. To commemorate the historic crossing of the Delaware River by General Washington and the Continental Army on Christmas night 1776, preceding the victory at Trenton, the Commonwealth authorized the creation of a state park at the scene of this event.

438. This 478-acre park is divided into two sections; Bowman's Hill and Washington Crossing. Basically historical in origin, the park contains several historic landmarks and monuments. The Thompson Neely House (1702) is restored and maintained as a museum.

439. Visitors are attracted to this area by its "open space" appeal for family picnics and out-of-doors relaxation. The Delaware River affords opportunities for fishing; however, swimming is not possible because of poor water quality. A wildflower preserve has proven to be popular and the hiking trails are heavily used. A bird banding station in the park has developed into a "nature center" with interpretive lectures as a regular feature. Restored colonial buildings add to the appeal of the area.

440. Located 23 miles northeast of Philadelphia and 8 miles northwest of Trenton, and easily reached from all points by good roads, the park has an annual average visitation of more than 1,500,000 persons. Of this number, 75 percent come from the cities and towns of Pennsylvania and New Jersey, and the remainder from surrounding States and across the Nation.

441. Present plans include a continuing program of restoration and rehabilitation of colonial structures and the construction of launching facilities for boating on the Delaware River.

STATE FORESTS

442. Pennsylvania's State forests are administered by the Department of Forests and Waters, through the State Forester.(37) The purpose of these forests is "to provide a continuous supply of timber, lumber, wood and other forest products, to protect the watersheds, conserve the waters, regulate the flow of rivers and streams, and to furnish opportunities for healthful recreation to the public". The Department is authorized to reserve within the State forests, unusual or historical groves of trees, or natural features especially worthy of permanent preservation, and to make the same accessible and convenient to the public use, and to dedicate them in perpetuity to the people of the State for their recreation enjoyment. Any State-owned land under the jurisdiction of the Department of Forests and Waters may be set aside for exclusive use as parks, parkways, and other places of scientific, scenic, historic, or wildlife interest and to provide additional recreation areas.

443. Within the Pennsylvania portion of the Delaware River Basin, there is one State forest. Forest lands within the Basin aggregate 71,387 acres, on which are located four recreation areas for the use and enjoyment of the public. These areas are equipped with tables and benches, fireplaces, safe water, parking space, and other facilities for the convenience of visitors.

Delaware State Forest

444. This forest derives its name from the Delaware River, which forms its eastern boundary and drains the entire forest.

445. The area is easily accessible, being located 100 miles from Philadelphia and 90 miles from New York City. Although 14 detached tracts make up the 71,387 acres, each area can be reached over hard-surfaced or improved roads. The great bulk of the forest is in Pike County and only one-eighth of the total area is in Monroe County.

446. The terrain is typical of the Pocono Plateau region, being characterized by a series of broad mountain plateaus at varying elevations. Within the forest are eight lakes, four of which are glacial and four artificial.

447. There are three developed recreation areas on the forest offering facilities for camping, picnicking, swimming, hiking, hunting, and fishing. Three hundred and twenty-five acres are contained in these developments. These areas receive approximately 5,000 visitors annually.

448. Bruce Lake and Stillwater Forest Monument are wilderness areas with a total of 5,700 acres. No extensive developments have been permitted and these areas are in their natural condition, with the exception of numerous trails. No roads traverse the area and access is by foot travel only. Camping permits are issued for periods of 24 hours only.

449. Hunting is permitted on lands at a safe distance from developed recreation areas.

450. The present recreation developments in the Delaware State Forest are not used to full capacity, chiefly because of the absence of suitable recreation water areas. The two wilderness areas are the only such areas preserved in the Basin.

STATE GAME AND FISH LANDS

451. The Board of Game Commissioners (37) has jurisdiction over game and wildlife matters of the State. The Game Commission is authorized to acquire title to or control of lands and/or buildings or hunting rights or other rights on land suitable, among other things, for public hunting and trapping. Lands so acquired may be used for the purpose of creating and maintaining state game refuges and/or hunting grounds or for the propagation of game. The Commission may grant rights to maintain ski runs or trails for towing, the Highway Department may construct roadside rests, any State or Federal agency may contruct and operate water impoundments or flowage for flood control or recreation; however, no campsite may be leased and no overnight camping is permitted on State game lands except for officers and agents of State or Federal agencies in the performance of duty.

452. Any natural stream or lake that has been stocked with fish by the State is open to the public for lawful fishing.

453. Within the Basin portion of the State there are 28 game land areas with a total of 109,560 acres. These public hunting areas are located principally in the Appalachian Province; however, 10 areas are situated in the Piedmont Province south of Blue Mountain.

454. To supplement these publicly-owned game lands, the Cooperative Farm-Game Program provides an additional 213,579 acres available for public hunting. This program was initially begun in the vicinity of Philadelphia as an effort to provide hunting area on lands previously closed to hunting.

HISTORIC SITES

455. The Pennsylvania Historical and Museum Commission is responsible for preserving or restoring ancient or historical public buildings, military works, or monuments connected with the history of the State, and to assume the care and maintenance of such historical buildings, grounds, monuments, or antiquities committed to its custody by the General Assembly; and to make and enforce rules for the visitation of such places by the public.(37)

456. Within the Basin portion of Pennsylvania, the State now has six historic sites in public ownership that are open to the public.

Conrad Weiser Memorial Park

457. The park consisting of 26 acres, is located on U.S.422 at the eastern edge of Wornelsdorf. Originally a community park, it was accepted by the Commonwealth in 1935 through appropriate legislative action. The original one-room Weiser house, to which a second room was added in 1751, is now used as a museum and contains appropriate furnishings of that period. The large stone house (1834) has been restored and is used as the park superintendent's home. The original Weiser spring has been renovated and the rest of the grounds laid out in suitable style.

Daniel Boone Homestead

458. About 9-miles southeast of Reading is the birthplace and boyhood home of Daniel Boone, symbol of the American pioneer spirit. As frontiersman and scout his name is legend to every American boy. The original log cabin is gone but the present storehouse is said to occupy the site of the Boone home.

459. There are picnic facilities available for day-use.

Pennsbury Manor

460. On the west bank of the Delaware River near Bristol stands Pennsbury Manor the reconstructed home of William Penn. The home was reconstructed by the Commonwealth of Pennsylvania to honor one of the great men in its history. The original house was in ruins by 1736 and beyond hope of repair. In 1932, the land was deeded to the Commonwealth and plans were prepared for the reconstruction of Pennsbury Manor. The manor house and outbuildings were completed in 1939. Since that time, the herculean task of restoring the gardens, landscaping the ground and furnishing the various structures has been accomplished.

Pottsgrove

461. One of Pennsylvania's outstanding examples of colonial architecture is the fine stone mansion built in 1752 by John Potts. The history of Pottsgrove is closely related to the Pennsylvania iron industry, for near here in 1716 Thomas Rutter and Thomas Potts began the first manufacture of iron in Pennsylvania. John Potts died in 1768 and his eldest son took up residence at Pottsgrove. Tradition

states that during the American Revolution, Washington used the house for a short time as his headquarters in 1777. There is a well-supported family tradition that during Washington's encampment at Valley Forge Martha Washington made her home at Pottsgrove and Washington was a frequent guest.

COUNTY AREAS - PENNSYLVANIA

BERKS COUNTY

462. None

BUCKS COUNTY

463. Bucks County has a newly formed park organization for the planning and development of a county system of parks. There are presently two undeveloped areas with a total of 212 acres of nonurban park land owned by the county.

CARBON COUNTY

464. None

CHESTER COUNTY

465. None

DELAWARE COUNTY

466. Delaware County has a total of 264 acres in ten areas devoted to recreation use. Four parks comprising 127 acres, are administered by the Delaware County Park and Recreation Board, and 105 acres in four tracts are undeveloped. Two areas of 32 acres are leased to local civic organizations.

467. The four active county parks are strictly municipal in character and fulfill urban needs. Picnic facilities are available in Glen Providence and Smedley County Parks. Kent and Shrigley County Parks are playgrounds for small children.

LEHIGH COUNTY

468. The City of Allentown-Lehigh County Recreation Department administers a 1,100-acre nonurban recreation area, Trexler Game Preserve. A fee is charged for admission to the area which is open weekends. No recreation facilities are provided.

MONROE COUNTY

469. None

MONTGOMERY COUNTY

470. The county parks are under the jurisdiction of the County Commissioners who are assisted in their development by the recommendations of the County Park Board, an advisory body that studies the county's recreational needs. (41)

471. This county park system includes four nonurban areas; Upper Perkiomen and Lower Perkiomen Valley Parks, Lorimer Park, and the Audubon Shrine and Bird Sanctuary. These four units have an aggregate area of 808 acres devoted to recreation uses. In addition to these county administered areas, 600-acre Camp Delmont is owned and operated by the Valley Forge Council of Boy Scouts for Montgomery and Delaware Counties and Camp Rainbow is a function of the County Court for underprivileged children.

472. Upper Perkiomen Valley Park is a highly-developed area of rolling hills, partly wooded and partly open meadows, extensively used for sports and games. A 38-acre artificial lake is available for swimming, boating, and fishing in summer, and skating in winter. Near the lake is an appropriately designed and constructed shelter and first aid station. Provision has been made for winter night skating by lighting a portion of the lake. Other facilities include picnic and camping areas, hiking trails, bathing beach, bathhouses, tennis courts, ballfields, paved roads, and parking areas. Total area of the park is 553 acres.

473. Lower Perkiomen Valley Park is a picnic and swimming area adjacent to the Audubon Shrine and provides a picnic area for visitors.

474. Lorimer Park is essentially a nature park with limited picnic facilities. Several miles of equestrian and foot trails wind through these 134 acres of woodland. Pennypack Creek flows through the park.

475. Although Montgomery County parks are better than average, they are inadequate to serve the 450,000 inhabitants of the county and are closed to nonresidents. This limitation on use is necessitated by the over-all lack of adequate facilities in surrounding counties and metropolitan areas, and is strictly enforced in the Upper Perkiomen Valley Park and on weekends in Lorimer Park. The Audubon Shrine is open to all visitors.

476. Mill Grove, the first home of John James Audubon in America, is preserved as an historic shrine and wildlife sanctuary in memory of the famous painter of American birdlife. The mansion is partially furnished with period pieces and contains many reproductions and original paintings by Audubon. The surrounding 121 acres have appropriately been designated a bird sanctuary. The shrine is open to the public.

477. Approximately 650,000 visitors use these county parks each year.

NORTHAMPTON COUNTY

478. None

PHILADELPHIA COUNTY

479. None

PIKE COUNTY

480. None

SCHUYLKILL COUNTY

481. None

WAYNE COUNTY

482. None

MUNICIPAL AREAS - PENNSYLVANIA

483. The City of Reading owns five tracts of land now used or available for nonurban recreation purposes. Four of these parcels were or are part of the City's water supply system. The fifth tract is an excellent park occupying a high hill overlooking the city and providing facilities for picnics, hiking, sightseeing, and nature study.

COMMERCIAL DEVELOPMENTS - PENNSYLVANIA

484. The Pocono Mountains are Pennsylvania 's major recreation region. The area includes Monroe, Pike, and Wayne Counties, the northeast part of Carbon County, and a narrow band along the eastern borders of Susquehanna, Luzerne, and Lackawanna Counties. Woods, trails streams, and lakes are the main attractions. Here, summer affords relief from heat and noise of the city. Winter attractions include hunting, skiing, and quiet relaxation. Camps for children and adults, plus large self-contained resort hotels, typify the Poconos. Many small establishments are in existence, but they offer few services and frequently function as family enterprises. This region owes its importance as a vacation and recreation center not only to the picturesque character of its terrain, but largely to its proximity to and accessibility from centers of urban population.

485. The first spots in the area to become resorts were Delaware Water Gap, Mount Pocono, and points along the Delaware, Lackawanna and Western Railroad. Today, the northeastern quarter of Monroe County has the most concentrated cluster of resorts. Other important centers have developed in the southeastern portion of the region along the Delaware River and the area between the northern tip of Lake Wallenpaupak and the boundary of Monroe County. Individual resorts are also

scattered over most of the western half of the region. A concentration of vacation farms may be found in the narrow strip of agricultural land situated between the eastern edge of the Pocono Mountains and the Kittatinny Ridge, on the southern boundary of the region. A recent estimate places the number of resorts at more than 300. At least 75 motels have invaded the resort industry by catering to guests who stay longer than overnight. A particularly heavy concentration of motels may be found on U.S. 611 between Stroudsburg and Mount Pocono. One hundred and twenty-five rooming houses and family unit rental cottages provide accommodations for the economy-minded. These facilities will handle 26,000 visitors per day, and 300,000 were accommodated during 1956.(42)

485. Variation in accommodations is pronounced. Some camps pride themselves on the opportunity for "roughing it". The other extreme is the plush modern hotel with luxurious accommodations. A comparatively recent development within the area is the sign "Honeymooners Only", and the sign means just what it says. As a result, the Poconos have become a rival for Niagara Falls, and local partisans claim this is the new honeymoon capital of the country.

486. The construction of the Northeast Extension of the Pennsylvania Turnpike through the extreme western edge of the Pocono Mountains makes the western and southern portions of the area much more accessible to Metropolitan Philadelphia than it was previously. It will undoubtedly attract greater development to this region, particularly the construction of motels in the vicinity of interchanges. Should the proposed east-west Keystone Shortway be constructed, having its eastern terminus at Stroudsburg, the southern and western portion of the Poconos would be made even more accessible to city dwellers. (43)

VI - EVALUATION OF EXISTING NONURBAN RECREATION AREAS

487. An evaluation of existing nonurban recreation areas and developments could be made from several points of view. The approach that seems most logical in view of the concentration of people within the Basin would be an analysis of the degree to which present nonurban recreation areas and developments are meeting the needs of the Basin population. Such an evaluation would give consideration to: (1) Number, type, and potential of existing areas; (2) Existing areas and facilities in relation to population; (3) Acreage-population ratio. An analysis based on these factors, of course, would not take into consideration the inherent qualities of individual areas or systems, but would be concerned primarily with the ability of areas and systems to absorb large numbers of visitors for specified activities. In this metropolitan region, open space, a place for nonurban recreation activities, is the principal problem.

FEDERAL AREAS

488. The factors listed above could not be applied to an evaluation of federally-owned areas for the reason that these land areas within the Basin were set aside for specific purposes. These purposes were not related to space requirements for recreation or concerned with any definite participation type activities. However, it is recognized that Federal land areas of almost any type do contribute materially to fulfilling space and facility needs of the State and/or the community in which the area may be located. For example, Bombay Hook National Wildlife Refuge in Delaware provides excellent opportunities for such day use activities as bird watching, fishing, and some hunting for the people of Delaware and surrounding States. Hopewell Village National Historic Site serves local as well as national recreation needs.

489. In the Delaware River Basin, the Federal Government through the Department of the Interior and the Department of Defense administers land used wholly or in part for nonurban recreation purposes.

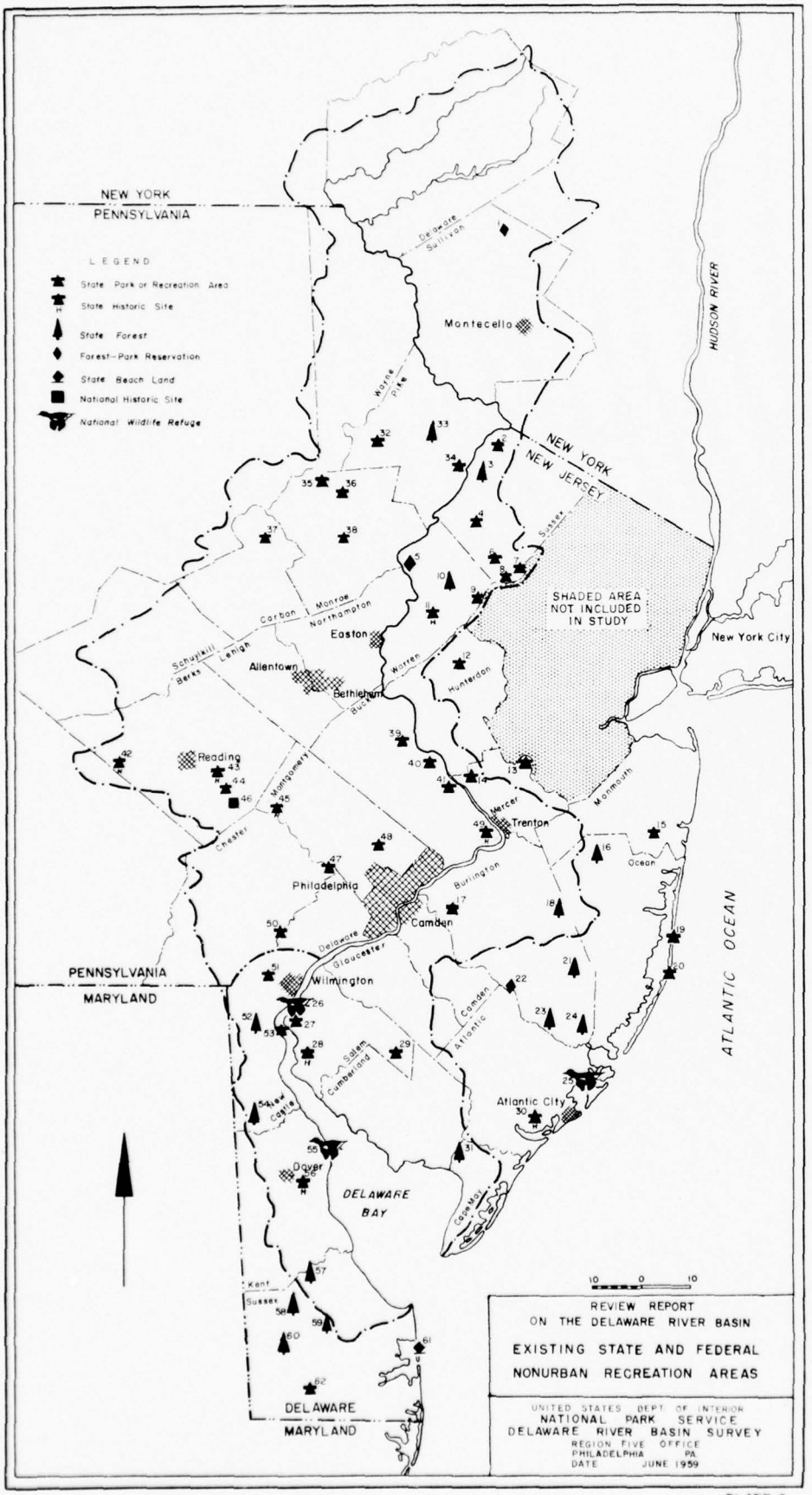
DEPARTMENT OF THE INTERIOR

490. Two bureaus of the Department of the Interior, the National Park Service and the U.S. Fish and Wildlife Service, administer land areas within the Basin and included study area that are used solely or in part for their recreation, historic and/or scientific values.

NATIONAL PARK SERVICE

491. The National Park Service is legally responsible for the preservation, administration, and use of federally-owned properties entrusted to its care. All areas within the National Park System have been determined to be of national significance and as such are worthy of preservation for the inspiration and benefit of all the people of the United States. Two such areas are located within the

RECREATION AREAS	COUNTY	AREA (acres)	ADMINISTRATIVE AGENCY	PRINCIPAL ATTRACTION	RECREATION ACTIVITIES: DAY-USE VACATION	WINTER	SUMMER	CAMPING	PICNICS	SWIMMING	PLAYFIELD	BOATING	HIKING	WINTER SPORTS	HUNTING	FISHING	MUSEUMS	WILDERNESS	OVERNIGHT ACCOMMODATIONS: HOTEL or LODGE NO.	HOTEL or LODGE CAP.	FAMILY UNIT CABINS NO.	FAMILY UNIT CABINS CAP.	TENT OR TRAILER CAMPSITES NO.	GROUP CAMPS NO.	GROUP CAMPS CAP.	AVERAGE ANNUAL VISITATION 5 YEARS PRIOR
PENNSYLVANIA (76)																										
FEDERAL AREAS (1)																										
National Historic Site(1)																										
Hopewell Village	Berks	848	U.S.D.I., National Park Service	Historical Iron Making Village	X	-	X	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	74,838
		848																								
STATE AREAS (55)																										
State Parks (13)																										
Big Pocono	Monroe	1,305	Dept.of Forest & Waters, Div.of State Parks	Scenic View	X	-	-	X	-	X	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	62,740
Brandywine Battlefield	Delaware	50	Brandywine Battlefield State Park Comm.	Revolutionary War Bldgs.	X	-	X	X	-	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	28,843
Fort Washington	Montgomery	493	Dept.of Forest & Waters, Div.of State Parks	Historic & Day-Use Area	X	-	-	X	X	X	-	X	-	-	-	-	X	-	-	-	-	-	-	-	-	85,040
French Creek	Berks	5,933	- do -	Forest, Lake, Outing, etc.	X	X	X	X	X	X	X	X	X	-	X	X	-	-	-	-	-	-	82	3	254	1,030,298
George W. Childs	Pike	281	- do -	Scenic Ravine & Stream	X	-	-	X	-	X	-	-	-	X	-	-	X	-	-	-	-	-	-	-	-	75,778
Gouldsboro	Monroe	2,800	- do -	Forest and Lake	X	-	-	X	-	X	X	-	X	-	-	X	X	-	-	-	-	-	-	-	-	- -
Hickory Run	Carbon	13,386	- do -	Forest, Streams, Glaciation	X	X	X	X	X	X	X	X	-	X	X	X	X	-	-	-	-	-	104	2	275	356,184
Promised Land	Pike	2,328	- do -	Forest and Lake	X	X	-	X	X	X	X	-	X	-	X	X	-	-	-	-	12	66	385	-	-	406,873
Ralph Stover	Bucks	44	- do -	Scenic Ravine and Stream	X	X	-	X	-	X	X	-	-	-	-	-	X	-	-	-	6	26	-	-	-	102,873
Roosevelt	Bucks & Northampton	800	- do -	Historical Canal	X	-	X	X	-	-	X	X	-	-	-	X	-	-	-	-	-	-	-	-	-	69,258
Tobyhanna	Monroe	7,500	- do -	Forest and Lake	X	-	-	X	-	X	X	-	X	-	X	X	-	-	-	-	-	-	-	-	-	63,335
Valley Forge	Montgomery	2,033	Valley Forge State Park Commission	Historic Revolutionary Encampment	X	-	X	X	X	-	-	-	-	-	-	-	X	-	-	-	-	-	25	-	-	2,408,544
Washington Crossing	Bucks	478	Washington Crossing State Park Commission	Point of Washington's Crossing Delaware River	X	-	X	X	-	X	-	-	-	X	-	-	X	X	-	-	-	-	-	-	-	1,493,540
		37,231																								
State Forests (1)																										
Delaware	Pike & Monroe	71,387	Dept.of Forests & Waters, Div. of Forests	Forest and Lake	X	X	X	X	X	X	X	-	X	X	-	X	X	-	X	-	-	-	-	-	-	4,177
		71,387																								
State Game Lands (29)																										
No. 43,52,108,110,182	Berks	7,417	Pa. Game Commission	Public Hunting	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	- -
No. 56,139,157,196	Bucks	3,927	- do -	- do -	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	- -
No. 40,129,141	Carbon	25,648	- do -	- do -	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	- -
No. 43	Chester	572	- do -	- do -	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	- -
No. 205,217	Lehigh	2,482	- do -	- do -	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	- -
No. 38,127,129,186,221	Monroe	31,162	- do -	- do -	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	- -
No. 168	Northampton	1,401	- do -	- do -	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	- -
No. 116,180,183,209	Pike	12,598	- do -	- do -	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	- -
No. 80,108,110,132,180	Schuylkill	11,963	- do -	- do -	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	- -
No. 70,159	Wayne	12,690	- do -	- do -	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	- -
		110,060																								
Public Fishing Areas (8)																										
FC 8,39	Berks	34	Pa. Fish Commission	Public Fishing	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	- -
FC 62,74	Bucks	109	- do -	- do -	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	- -
FC 16	Chester	50	- do -	- do -	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	- -
FC 55	Monroe	325	- do -	- do -	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	- -
FC 51, Reinings Pond	Wayne	641	- do -	- do -	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	- -
		1,159																								
Historic Sites (4)																										
Conrad Weiser Memorial Park	Berks	26	Historical & Museum Commission	Home of Pennsylvania Pioneer	X	-	X	X	-	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	7,966
Daniel Boone Homestead	Berks	192	- do -	Site of Birthplace of Daniel Boone	X	-	X	X	-	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	28,974
Pennsbury Manor	Bucks	41	- do -	William Penn's Country Home	X	-	X	X	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	23,513
Pottsgrove	Montgomery	1	- do -	Home of John Potts	X	-	X	X	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	1,802
		260																								
COUNTY AREAS (15)																										
2 Parks (Undeveloped)	Bucks	212	Bucks County Park Bd.	Nonurban Space	U	N	D	E	V	E	L	O	P	E	D				-	-	-	-	-	-	-	- -
8 Parks (4 Undeveloped)	Delaware	264	Delaware County Park & Recreation Board	Day Outing Activities	X	-	-	X	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	- -
1 Game Preserve	Lehigh	1,100	City of Allentown-Lehigh County Recreation Dept.	Wildlife	X	-	X	X	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	- -
4 Parks	Montgomery	840	Montgomery County Park Board	Day Outings	X	-	X	X	-	X	X	X	-	X	X	-	X	X	-	-	-	-	-	-	-	650,000
		2,416																								
MUNICIPAL AREAS (5)																										
5 Parks (2Undeveloped)	Berks	3,504	City of Reading, Dept of Parks & Public Property	Day Outings	X	-	X	X	-	X	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-	- -
		3,504																								
		226,865																								



REVIEW REPORT
ON THE DELAWARE RIVER BASIN
EXISTING STATE AND FEDERAL
NONURBAN RECREATION AREAS

UNITED STATES DEPT. OF INTERIOR
NATIONAL PARK SERVICE
DELAWARE RIVER BASIN SURVEY
REGION FIVE OFFICE
PHILADELPHIA PA.
DATE JUNE 1959

PLATE 6

EXISTING NONURBAN RECREATION AREAS

NEW YORK

1. Catskill Forest Preserve

NEW JERSEY

2. High Point State Park
3. Stokes State Forest
4. Swartswood State Park
5. Worthington Tract
6. Cranberry Lake State Park (Undeveloped)
7. Hopatcong State Park
8. Musconetcong State Park
9. Stephens State Park
10. Jenny Jump State Forest
11. Oxford Furnace State Historic Site
12. Voorhees State Park
13. Princeton Battlefield State Park
14. Washington Crossing State Park
15. Allaire State Park
16. Jackson State Forest
17. Mount Laurel State Park (Undeveloped)
18. Lebanon State Forest
19. Island Beach State Park
20. Barnegat State Park
21. Penn State Forest
22. Wharton Tract
23. Greenbank State Forest
24. Bass River State Forest
25. Brigantine National Wildlife Refuge
26. Killcohook National Wildlife Refuge
27. Fort Mott State Park
28. Hancock House State Historic Site
29. Parvin State Park
30. Somers House State Historic Site
31. Belleplain State Forest

PENNSYLVANIA

32. Promised Land State Park
33. Delaware State Forest
34. George W. Childs State Park
35. Gouldsboro State Park
36. Tobyhanna State Park
37. Hickory Run State Park
38. Big Pocono State Park
39. Ralph Stover State Park
40. Roosevelt State Park
41. Washington Crossing State Park
42. Conrad Weiser State Historic Site
43. Daniel Boone Homestead State Historic Site
44. French Creek State Park
45. Pottsgrove State Historic Site
46. Hopewell Village National Historic Site
47. Valley Forge State Park
48. Fort Washington State Park
49. Pennsbury Manor State Historic Site
50. Brandywine Battlefield State Park

DELAWARE

51. Brandywine Springs State Park
52. Red Lion State Forest
53. Fort Delaware State Park
54. Blackbird State Forest
55. Bombay Hook National Wildlife Refuge
56. John Dickenson Mansion State Historic Site
57. Appenzellar State Forest
58. Ellendale State Forest
59. Redden State Forest
60. Owens State Forest
61. State Beach Lands
62. Trap Pond State Park

Basin, Hopewell Village National Historic Site and Independence National Historical Park. The latter area being located in the City of Philadelphia will not be treated further in this report.

492. Hopewell Village National Historic Site is the only area in the National Park System depicting the beginning of one of the great industries of America. Subsequent to establishment, historical and archaeological research, protection, and limited restoration of the area proceeded until World War II. This program was resumed in 1947 and gained considerable impetus with the MISSION 66 program of the National Park Service. The preservation of the area will be primarily a matter of restoration and rehabilitation of some 23 buildings, which will include the original cold-blast charcoal burning furnace, ironmaster's mansion, tenant dwellings, village store, and other related structures.

493. The visitor's enjoyment of the area is primarily aesthetic. There are no active recreation facilities provided. The present plan of restoration and operation is in keeping with the significance of the area.

UNITED STATES FISH AND WILDLIFE SERVICE

494. The conservation of migratory bird resources through a system of strategically located wildlife lands managed primarily to serve as nesting, resting, and wintering sanctuaries for migrating birds is a responsibility of the U.S. Fish and Wildlife Service. Incidental to this main purpose, these lands also yield substantial benefits to big game, upland birds, other wildlife, and to public recreation.

495. The three National Wildlife Refuges, Bombay Hook, Killicohook, and Brigantine, located in the Basin and included study area are administered by the U.S. Fish and Wildlife Service in keeping with the purpose for which they were established and in addition provide nonurban recreation opportunities that do not negate the primary purpose of waterfowl protection. These refuges are located in areas of tidal or salt marsh and are not readily adaptable for the development of intensive day-use or weekend purposes. As the extent of marshland habitats disappear due to industrial encroachment, drainage, filling, and residential development, the importance of these refuges to migratory waterfowl and as examples of natural marsh landscapes will certainly increase.

DEPARTMENT OF DEFENSE

496. Through the Department of the Army and the Corps of Engineers, the Department of Defense administers land and water areas dedicated to purposes other than recreation, but used secondarily for nonurban recreation and/or conservation. The two specific areas in this category are the federally-owned lands and ponds adjacent to the Chesapeake and Delaware Canal and a spoil deposit area adjacent to Fort

Mott State Park, New Jersey. The former area is used by the Delaware Board of Game and Fish Commissioners for public hunting and fishing, and the latter by the U.S. Fish and Wildlife Service as the Killicohook National Wildlife Refuge.

497. The prior interests of the Corps in the use of these lands for purpose associated with the operation and maintenance of the canal and the ship channel in the Delaware River is recognized to take precedence over the secondary uses.

NUMBER, TYPE, AND POTENTIAL OF EXISTING STATE-OWNED NONURBAN RECREATION AREAS

498. Symbols on a map might appear to indicate that sufficient nonurban recreation areas are available to the Basin population. Inasmuch as no uniform criteria was employed in the selection of areas used for recreation, considerable variations are found, particularly with regard to state parks. For example, areas designated as state parks vary from 20-acre undeveloped tracts to parks in excess of 10,000 acres and containing considerable investments in capital improvements. Some state parks receive tremendous visitor impact while others are used primarily by local communities.

499. Striking differences also occur with regard to other areas such as state forests and public hunting and fishing grounds. State forests range from 5-acre tracts to a 71,000 acre forest now serving significant nonurban recreation needs. A program for the management of public hunting and fishing grounds in one state may encourage multiple recreation use of its lands while another state may impose restrictions upon the use of its hunting and fishing areas.

500. The over-all nonurban recreation potential with regard to further expansion of the existing area and/or the facilities will vary from one area to another. Many of the areas now available to Basin residents are limited by available space, recreation water, topography, surrounding developments and other factors that virtually eliminates the possibility of increasing the visitor capacity of the area concerned.

STATE AREAS - DELAWARE

501. Within the State of Delaware, there is a total of 39 management units or parcels of land used wholly or in part for nonurban recreation purposes. This number includes 3 State Parks, 6 State Forests, 1 State Historic Site, 28 Wildlife Areas for hunting and fishing and State-owned beach lands.

STATE PARKS

502. The three nonurban State Parks in Delaware are examples of the contrast found in many state park systems. Brandywine Springs

is essentially an urban park catering to the needs of a suburban area for day-use activities. The second, Fort Delaware, is an historic area located on an island in the Delaware River and not readily available to the public except by water taxi. The third, Trap Pond while principally a day-use area, most nearly meets the criteria normally associated with state parks. Brandywine Springs and Fort Delaware are limited by available space and geographic location, respectively, from making significant contributions to fulfilling nonurban recreation needs in the Wilmington Metropolitan Area. Trap Pond is more favorably situated with regard to available land area and opportunities for development into a nonurban recreation area of major importance to the State. Adequate recreation resources are available and the need exists to warrant the further development of Trap Pond for intensive day and extensive weekend and vacation recreation purposes.

STATE FORESTS

503. The State Forests of Delaware are located in the center of the State on the divide between Delaware Bay and Chesapeake Bay, near the headwaters of the small coastal streams, and are without lakes or ponds of any size or any significant streams. Of the six forests, only Blackbird is located in the hardwood region of the State. The other five are in the southern pine section.

504. The forests of the State are situated in flat country and are lacking in resources of recreational variety and interest.

505. As public lands potentially available for recreation use, these forests should be considered, among other possible uses, as potential recreation resources. The continued use of State forest lands for purposes of roadside parks and for wildlife purposes, would constitute the best present recreational use of these areas.

HISTORIC SITES

506. The one historic site administered by the State, John Dickinson Mansion, contributes to the understanding and appreciation of the State's history. The benefits to be gained here are aesthetic. Adequate visitor services and facilities are available.

507. The development of this area for intensive day-use purposes would detract from the historical aspects of this site.

STATE BEACH LANDS

508. The Atlantic Coastal Region of the State constitutes the most significant recreation resource of Delaware. This, plus the fact that 60 percent (2,650 acres) of the State's ocean frontage is in State ownership makes this area the most important recreation region in the State. Presently, these lands are inadequately developed to meet demands for their use.

509. Ample opportunity exists here for the establishment of a

State park to preserve the natural features of an essentially unimpaired beach environment and for the creation of intensive day-use and camping areas, each without encroaching upon the other type of desired use. Good sites are available for the development of marina and fishing facilities. It is estimated that ample space is available for developments to fulfill the seashore recreation needs of the State's population for the present and the foreseeable future.

WILDLIFE AND FISHING AREAS

510. The State's fish and wildlife program includes sites for upland and waterfowl hunting, rehabilitated and reconstructed ponds and lakes for fishing and waterfowl shooting, inland river access points and boat launching sites on lakes, ponds, and streams and on the Delaware River and Delaware Bay. The Board of Game and Fish Commissioners is pursuing an energetic program to provide the State's citizens with the best possible hunting and fishing on State-owned lands.

511. The State wildlife areas are not particularly well adapted to multiple recreational uses and most activities are directly related to fishing and hunting; however, other activities are permitted and encouraged. Petersburg and Assowoman Wildlife Areas are examples of multiple-use in that recreation activities other than hunting and fishing are a part of the management program. Opportunities for multiple-use exist at all pond or lake restorations accomplished primarily for fishing and/or hunting purposes. This must not be interpreted to mean that fishing or hunting benefits should be sacrificed for the benefit of other forms of nonurban recreation. Present State acreage in public hunting and fishing areas is inadequate to meet the present demand, which will increase with population growth and with continued encroachment by industry and suburban development upon what was formerly open land potentially available for hunting and fishing purposes. The importance of these wildlife areas will increase not only for hunting and fishing purposes but equally so as natural areas.

STATE AREAS - NEW JERSEY

512. Within the Basin portion and the included study area of the State of New Jersey is a total of 61 State areas used wholly or in part for nonurban recreation purposes as follows: State Parks-15; State Forests-8; Forest-Park Reservations-2; Public Hunting and Fishing Grounds-33; Historic Sites-3.

STATE PARKS

513. The 15 State parks in the Basin portion and included study area of the State, fall into four obvious categories: (1) Natural areas, providing opportunities for day-use recreation and having facilities for overnight or vacation periods; (2) Historically significant parks with day-use facilities; (3) Day-use parks of local or regional significance; (4) Undeveloped areas.

514. High Point, Island Beach, and Parvin State Parks are considered in the first category in that each is a spacious area in which the existing natural features are being preserved and opportunities for intensive and extensive recreation are available to the visitor. The significance of High Point as a State park is the fact that the highest point in the State (1,803 feet) is located in the park, plus sufficient surrounding lands to preserve the natural values of this mountainous area. Parvin is essentially a recreation area in which the flora is of particular interest and is protected against spoliation. Both of these areas are making significant contributions to the fulfillment of nonurban recreation needs in their respective sections of the State. Either area could be further developed to accommodate at least twice the present capacity without endangering park values. Island Beach is a new seashore park created to preserve a portion of the area in its natural condition and to make available to the public much needed ocean beach for swimming, surf fishing, camping, etc. Unless rigidly controlled, the existing natural values will be lost as the result of overuse.

515. The historically significant parks with day-use facilities for picnics, are Allaire, Barnegat Lighthouse, Fort Mott, Princeton Battlefield, and Washington Crossing where some interpretive services are also available. Allaire is in the process of being restored and adequate picnic space is being provided to accommodate day visitors to this historical area. The remaining parks have been developed to their maximum capacity consistent with their present acreage, with the exception of Fort Mott which could accommodate a boating activity. None of these areas should be considered for development to the detriment of their historical values.

516. Five New Jersey State Parks, Hopatcong, Musconetcong, Stephens, Swartswood, and Voorhees are developed for intensive day-use and are principally of local or regional significance. Hopatcong, Stephens, and Swartswood attract visitors from the Metropolitan New Jersey Region and are generally overused on normal peak days. Hopatcong is badly congested. Musconetcong is available to the public, but no facilities, have been provided as yet. Voorhees is a "dry park", i.e., there is no recreation water, and it receives only local use.

517. With the exception of Voorhees, these parks have been developed to the maximum capacity consistent with their present acreage.

518. The recreational potential of undeveloped Cranberry Lake and Mount Laurel State Parks would not justify the necessary expenditure to make these areas available to the public.

STATE FORESTS

519. Eight of New Jersey's ten State forests are located in the Delaware Basin and the included study area. Two of these, Jenny Jump and Stokes, are situated in the northern hardwood region and the remaining six, Bass River, Belleplain, Greenbank, Jackson, Lebanon,

and Penn, are in the southern "Pine Barrens". Each of these forests are developed to some extent for nonurban recreation activities, except Jackson State Forest, which is an experimental forest and has no recreation facilities.

520. Stokes State Forest is extensively used for recreation and Jenny Jump to a considerably less degree because of the lack of recreation water in any form. The water areas in Stokes are small and are the centers of present recreation developments. The acquisition of private inholdings, including lakes, and the rounding out of the forest boundary to include adjacent lakes would more than double the present visitor capacity. The acquisition of an existing lake adjacent to Jenny Jump would cause this forest to assume considerable significance for recreation purposes.

521. With the exception of Jackson, the remaining five State forests located in the Pine Barrens are now being used for nonurban recreation purposes. Lebanon State Forest, with its 22,000 acres, located 32 miles east of Philadelphia, possesses the least recreation potential. Presently two very small ponds are the centers for overcrowded day-use areas. A camping area and a limited number of vacation cottages are available. It appears unlikely that any sizeable water area can be developed within the forest, and lakes located near the boundary have been acquired for suburban developments. It is doubtful that Lebanon can be expected to accommodate any considerable number of recreationists due solely to the absence of water for recreation purposes.

522. Bass River, Belleplain, Greenbank, and Penn State Forests now have day-use recreation areas of some consequence; however, weekend and vacation facilities are limited. With the exception of Penn, the other three could be further developed in order to accommodate many times the present capacity. The acquisition of Oswego Lake and lands adjacent to Penn Forest would provide much needed day-use space for the expansion of present facilities. These four State forests possess considerable recreation potential for solving at least a part of the needs for space in the southern portion of the Basin. The nearness of these forests to the seashore is in all probability a factor accounting for the relatively light use of these areas for recreation, and it would be a factor to be considered in the planning for more intensive use.

FOREST-PARK RESERVATIONS

523. The Worthington and Wharton Tracts cover an area of 102,000 acres in the Kittatinny Mountains and Pine Barrens, respectively. The Wharton Tract is being developed for recreation and other purposes.

524. The Worthington Tract is essentially a wild area bordering on the Delaware River and with its forests, streams, and Delaware River frontage possesses considerable potential for extensive recreation purposes.



Creeping urbanization of beach lands. . .



. . . becomes this

525. The 96,000 acres of the Wharton Tract with its numerous lakes, streams, forests, and wildlife, together with its historic interest, has much to offer in solving the recreation needs of the Southern Basin. This tract lies within 30 miles of Philadelphia and is expected to accommodate 1,000,000 visitors annually when fully developed.

HISTORIC SITES

526. The majority of the historic sites preserved by the State are homes of the State's famous citizens, and since most of these are located within urban areas, only 3 sites, Hancock House, Somers House, and Oxford Furnace have been considered. In addition to houses, numerous monuments mark the locations of outstanding events and one iron-making furnace of historical interest is preserved.

527. The State's historic sites are small areas, no larger than is necessary to adequately present the historical significance of the site to the public. Many are less than 1 acre. With the exception of Oxford Furnace, all sites are adequately maintained and interpreted.

PUBLIC HUNTING AND FISHING GROUNDS

528. Through a system of public hunting and fishing grounds distributed throughout the State, the Division of Fish and Game is endeavoring to make this form of nonurban recreation available to the people of New Jersey. The 33 areas in the Basin and included study area are inadequate to meet the hunting and fishing pressures in this densely populated region. These public lands are also available for other nonurban recreation activities such as boating, swimming, and picnics; however, this use is secondary to hunting and fishing.

529. As our expanding civilization continues to reduce the quantity and quality of available hunting and fishing lands, these wildlife areas will increase in importance as space for this particular form of nonurban recreation is constantly being diminished. Multiple-use of these public lands for nonurban recreation should be permitted and encouraged only if such use does not or will not impair the area for fish and wildlife purposes.

STATE AREAS - NEW YORK

530. Within the New York portion of the Basin is 1 nonurban recreation area, 1 wildlife management area, and 33 miles of public fishing streams.

FOREST PRESERVES

531. The Catskill Forest Preserve can be considered as a nonurban recreation area only with qualifications. The State Constitution specifies that the forest preserves shall be forever kept

as wild areas, and as wild areas serve nonurban recreation needs so does the Catskill Forest Preserve serve the public. The administration of the area is in accordance with the language of the State Constitution in that every effort is made to maintain the wild condition of the forest preserves. Constitutional amendments have authorized the construction of certain ski trails and the use of three percent of forest preserve land for municipal water supply reservoirs.(38) Recreation facilities for day-use purposes and campgrounds are provided not so much to fulfill over-all recreation needs as to serve as fire prevention measures by concentrating camping and picnicking in localized areas.

532. The potential nonurban recreation value of the Catskill Forest Preserve is outstanding, particularly for weekend and vacation purposes. The inherent recreation values of this vast public preserve are considerably enhanced by its very favorable location with respect to the Nation's greatest concentration of population.

GAME MANAGEMENT AREAS

533. It is extremely unlikely that the State will ever be able to provide adequate free public hunting and fishing areas in the Delaware River Basin due to the proximity of the New York City Metropolitan Area with its 13,789,000 residents (1955).

STATE AREAS - PENNSYLVANIA

534. The Pennsylvania portion of the Basin contains 55 State-owned areas used wholly or in part for nonurban recreation purposes as follows: State Parks-13; State Forests-1; State Game Lands-29; Public Fishing Areas-8; Historic Sites-4.

STATE PARKS

535. The 13 State parks in the Pennsylvania portion of the Basin are now used to the full capacity of the facilities provided. These parks can be grouped readily into three classes according to the general type of area; (1) Large natural areas with space and facilities for both intensive and extensive nonurban recreation activities; (2) Historical parks with day-use facilities; (3) Small day-use parks of local interest.

536. In the first category are French Creek, Gouldsboro, Hickory Run, Promised Land, and Tobyhanna. All of these parks are of sufficient size to permit their development for intensive day-use and extensive weekend and vacation purposes. The utilization of the maximum potential benefits of French Creek and Hickory Run is dependent upon the development of additional recreation water. The terrain and cover of both of these parks are excellent for recreation purposes.

537. Gouldsboro, opened to the public in 1958, has day-use

facilities for picnics, swimming, fishing, and boating. This park is a good example of coordinated effort. The Department of Forest and Waters developed the park on its own land and developed a swimming area on a Fish Commission lake. The recreation potential is good and factors of space, topography, cover, and recreation water are favorable for the further development of the area for weekend and vacation purposes.

538. Promised Land is badly overcrowded; however, planned expansion, separation and relocation of existing developments will materially improve the park as well as increase the visitor capacity. The park is favorably situated with respect to topography, cover, access, and available recreation water to warrant further expansion of existing facilities.

539. Tobyhanna is now a day-use park; however, camping facilities are being installed and additional beach space developed. These added facilities will materially improve the park for over-all nonurban activities. The park possesses adequate potential for development that would cause the area to make a substantial contribution toward fulfilling the recreation needs of the Basin, particularly for weekend and vacation purposes.

540. The four historically significant parks are Brandywine Battlefield, Roosevelt, Valley Forge, and Washington Crossing. Each of these parks was established to preserve the site of a particular historical event or era and their administration is directed toward that objective. The primary recreation use of Brandywine Battlefield, Roosevelt, and Washington Crossing are for day outing purposes, particularly picnicking. Visitors to Valley Forge are attracted to the park primarily because of the scenic qualities and the historical significance of the area. Roosevelt State Park preserves a portion of the Delaware Canal as a relic of canal transportation in America.

541. The historical aspects of these parks would be better served by the removal of day-use facilities to other areas. Due to the absence of adequate space and facilities elsewhere, these parks are unnecessarily crowded to the point that much of the historical appreciation of the particular site is lost.

542. Four State parks, Big Pocono, Fort Washington, George W. Childs, and Ralph Stover, are relatively small in area or usable space, provide only day-use facilities, and are primarily of local significance. Big Pocono is an observation point for panoramic sightseeing with very limited usable space. Fort Washington is intensively used for day-use purposes although there is some historical significance attached to the area. George W. Childs and Ralph Stover afford day-use facilities and limited vacation accommodations (Stover only) for surrounding communities.

543. The potential of these parks in fulfilling a substantial

portion of the nonurban recreation needs of the Basin is limited. Big Pocono, George W. Childs and Ralph Stover are handicapped by present size, limited amount of usable area, and poor prospects for effective expansion. Fort Washington has little to recommend it as a State park although the location is good for suburban park purposes, providing intensive day-use facilities and space for Scout activities, including camping.

STATE FORESTS

544. The existing recreation areas located within the Delaware State Forest receive relatively light public use primarily because of the general absence of recreation water in these developments. Approximately 1,000 summer homes, cabins, and lodges occupy most of the lake shores within the forest.

545. The Delaware Forest possesses considerable potential for the fulfillment of nonurban recreation needs and is located in one of the most desirable inland sections of the Basin. With increased availability of recreation water, this forest would be capable of absorbing hundreds of thousands of visitors annually.

HISTORIC SITES

546. The State's four historic sites, Pottsgrove, Conrad Weiser Park, Pennsbury Manor, and Daniel Boone Homestead, located in the nonurban areas of the Basin, are preserved primarily in recognition of the historical importance of the person associated with each site. The quality of the preservation, restoration, or reconstruction of the respective structures is good. Each is equipped with adequate visitor facilities and interpretive services or devises. Picnic facilities are available at two sites.

547. With the possible exception of Daniel Boone Homestead, these sites are not generally suited for intensive development due primarily to the lack of available space.

STATE GAME LANDS AND PUBLIC FISHING AREAS

548. The 29 State game lands and 8 public fishing areas located throughout the Basin portion of the State are inadequate to provide the needed hunting and fishing space desired by the State's Basin population. Recreational use of these areas for purposes other than hunting and fishing is permitted, except that overnight camping is prohibited.

549. Opportunities exist for the multiple recreation use of many game and fish lands. In those areas where such uses would not conflict with the primary purposes for which the area was reserved, such multiple use could provide much needed additional space for nonurban recreation developments.

COUNTY AREAS

550. County-administered nonurban recreation areas are particularly lacking in the Delaware River Basin. This is true of the predominately rural and to a lesser degree in the urban counties. As a general rule, the counties that do have park or recreation organizations are located in the metropolitan regions and these supplement or replace borough or township systems and are essentially urban in character.

DELAWARE

551. Not one of the three counties in Delaware operates a nonurban park of any type. Sixty-four acres of land in 16 tracts have been acquired by New Castle County in connection with rural suburban developments. These lands are normally located along stream courses and will provide green belts of variety; however, any recreation benefit to be derived will be strictly local and extremely limited in extent.

NEW JERSEY

552. Five counties, Camden, Cape May, Gloucester, Mercer, and Ocean in the New Jersey portion of the Basin and the included study area have park or recreation organizations and park or recreation lands of some type. For the most part, these parks are urban in character and provide limited opportunities for picnics, swimming, boating, and organized games.

NEW YORK

553. The only county recreation area in the New York portion of the Basin is administered by Sullivan County. This is a 6-acre historical site, Minisink Battlefield, but there are no recreation facilities or services with the exception of a monument erected on the site.

PENNSYLVANIA

554. In the Pennsylvania portion of the Basin, Bucks, Chester, Delaware, Lehigh, and Montgomery Counties have park organizations for the administration of county parks. In Delaware County, the present developed areas are primarily urban in character. Bucks County has two undeveloped tracts. Chester County formed a park and recreation commission in 1958.

555. In the Basin, Montgomery County has the most significant system of nonurban county parks, including a well developed and administered park with day-use and camping facilities, a nature park, an historic site, and a day-use park. These four areas are inadequate to meet the needs of the county population for whom they are reserved.

VII - EXISTING NONURBAN RECREATION AREAS AND FACILITIES IN RELATION TO POPULATION CENTERS

556. A "rule of thumb" in fairly common practice would locate nonurban recreation areas within 25 miles of the contributing population and seldom farther than 50 miles. This rule implies that adequate facilities in number, type, and quality would be provided to serve the contributing population. The mere designation of an area as a State park or recreation area does little to solve recreation problems unless adequate facilities are provided. Therefore, not only should day-use areas be located within day-use driving distance, but they should be of adequate size and contain adequate facilities with regard to number, type, and quality to meet the needs which the area is expected to serve.

557. It has been determined that Basin residents will travel a median distance of 63 miles for purposes of day outings.(44) This distance of 63 road miles brings a considerable portion of the New Jersey seashore within day-use travel distance for 70 percent of Basin residents who are known to use this particular recreation region for day-outing purposes. This distance of 63 road miles is equivalent to 56 air line miles that has been used as the mean maximum distance Basin residents might be expected to travel for day outing purposes.

558. It has also been determined that swimming and picnics are the activities most often engaged in and desired while on day outings. Therefore, these activities have been used for determining the capacity of day-use areas. However, it must be pointed out that areas of primarily historic value may have no facilities for these specific activities, yet they may have quite adequate facilities for visitors to this type of area. In view of the overwhelming importance of swimming and picnics as day-outing activities, these activities have been used, without prejudice, in measuring the day use capacity of existing nonurban recreation areas. The visitor capacity of the various areas as indicated in Plate 7 then becomes the number of visitors that they can accommodate under desirable conditions for swimming and picnics.

559. Nonurban recreation areas for weekend and vacation purposes can and should be farther removed from urban centers than day-use areas. It is common practice to provide both types of facilities in State parks, forests, and other large recreation areas. To measure the capacity of existing nonurban recreation areas in this regard, the facilities for overnight use of the area were taken as a measure. The number of individual camp and/or trailer sites, hotel or lodge rooms, and/or family unit cabins were used as the basis for making this determination.

560. The population of the basin is concentrated in the central metropolitan belt which contains 82 percent of the Basin total. The

principal centers of population are Allentown, Bethlehem, and Reading in the coal and iron region and Trenton, Philadelphia, Camden and Wilmington in the diversified industrial section along the estuary of the Delaware River. Inasmuch as the Allentown-Bethlehem-Reading Metropolitan Area is a more or less continuous urban region extending from Easton and Philipsburg on the Delaware River to Reading and the same is true for the Trenton-Philadelphia-Wilmington Metropolitan Areas, these regions will be considered to comprise two massive metropolitan zones with the axis of the former extending from Easton to Reading and the axis of the latter extending from Trenton to Wilmington. Then by using the 25-mile and 56-mile radius about each axis, it becomes possible to determine the number, type, area, and visitor capacity of nonurban recreation areas within 25 and 56 miles of the axis of each metropolitan zone.

561. It will be noted on Plate 7 that an apparent void of nonurban recreation areas exists in Northeastern New Jersey. This is hardly the case. This region is not included within the study area, and the nonurban recreation areas located in this section of the State are unable to meet the demands placed upon them by the population residing in this metropolitan area and are, therefore,not available to residents of the Delaware River Basin. A further consideration of this region will be made in a later section.

562. Plate 7 indicates the distribution of existing nonurban recreation areas and facilities for day and overnight use in relation to the principal population zones of the Basin.

563. Twelve nonurban recreation areas are located within 25 miles of the axis of the Easton-Allentown-Bethlehem Metropolitan Zone. These 12 areas have a gross area of 16,168 acres and facilities for 27,090 day-use and 981 overnight visitors. Within the 56-mile radius there are 24 nonurban recreation areas with a gross area of 138,567 acres and facilities to accommodate 63,265 day-use and 4,529 overnight visitors.

564. Of the 12 recreation areas within 25 miles of the axis of this zone, five are historic sites that offer no visitor facilities other than those necessary for historical sightseeing in the respective areas. One area, Worthington Tract, is an undeveloped forest-park reservation. French Creek State Park, southeast of Reading, is the only large park in this zone and is heavily used by residents of the zone as well as those from Philadelphia, Wilmington, and Baltimore. The remainder of the areas are small in size and/or development to the extent that only meager contributions are made toward fulfilling the nonurban recreation needs of this zone. Day-use nonurban recreation areas are particularly lacking in both the Reading and Allentown-Bethlehem regions.

565. Six of the 12 recreation areas in the 25- to 56-mile radius are located in Pennsylvania and are used primarily by residents of that State. The six recreation areas located in New Jersey are used

primarily by residents of the New Jersey portion of the New York Metropolitan Area, acknowledging, however, that a considerable amount of "exchange use" does take place. For example, Promised Land and Hickory Run State Parks in Pennsylvania are favored camping areas for New Jersey residents and Philadelphians. With the possible exception of High Point State Park, all of these recreation areas are now to the maximum of their development and are inadequate to meet the needs of this metropolitan zone plus the influx of non-zone residents particularly from the New Jersey portion of the New York Metropolitan Area.

566. Within 25 miles of the axis of the Trenton-Philadelphia-Wilmington Metropolitan Zone are 18 nonurban recreation areas with a gross of 28,971 acres and facilities for 20,918 day-use and 304 overnight visitors. Within 56 miles of the axis there are 31 recreation areas with a gross area of 179,447 acres and facilities for 27,128 day-use and 1,269 overnight visitors. Four of the recreation areas within 25 miles of the axis are undeveloped and two are historic sites with no facilities for participation type activities. The remaining 12 offer picnic and/or swimming facilities and only two provide camping or other overnight facilities. These areas are presently used far in excess of existing facilities and the need for additional open space and facilities near these population centers is clearly pointed up.

567. The 14 nonurban recreation areas between the 25- and 56-mile radii are located on the Coastal Plain Section of New Jersey and Delaware. The more significant areas are in New Jersey and the nearness of these areas to the seashore is a factor contributing to the relatively light use of these potentially valuable recreation sites. The Wharton Tract (96,000 acres) in New Jersey and Blackbird State Forest in Delaware have no facilities for recreation use at the present time.

568. The New Jersey seashore is within day-use driving distance (56 air line miles) of the greater portion of the residents in the Trenton-Philadelphia-Wilmington Metropolitan Zone. Island Beach and Brigantine Lighthouse State Parks are the only State-owned beach front recreation areas along this highly commercialized seashore. Excellent beaches, ideal surf, and warm sunny days attract untold numbers of visitors to this playtime strand annually; however, the principal attraction seems to be the boardwalk, with its hotels, amusement piers, taffy shops, nightclubs, and honky-tonk atmosphere that prevails generally from Sandy Hook to Cape May.

569. In Delaware, two significant nonurban recreation areas, Trap Pond State Park and Delaware Beach are located outside the 56-mile mean minimum day-use travel distance. Trap Pond receives fairly heavy day-use on weekends and some camping on nonimproved camp sites. Day-use activities on Delaware's seashore are centered at Rehoboth Beach; however, day-use is evident throughout the full length of the beach. Camping is the principal activity on State

owned lands.

570. The Catskill Park in the Upper Basin is an outstanding region for nonurban recreation purposes, particularly for weekend and vacation outings; however, too remote to serve day-use needs of the Basin population.

ACREAGE POPULATION RATIO

571. It is often advantageous to approach an evaluation of recreation systems from the standpoint of the ratio of recreation lands in acres to the population which those acres are expected to serve. This ratio is normally expressed as a given number of acres per 1,000 population. The following table indicates the desirable minimum acreage for nonurban recreation purposes per 1,000 population for State, county, metropolitan and municipal levels of government.

DESIRABLE MINIMUM ACREAGE STANDARDS PER 1,000 POPULATION FOR PUBLICLY OWNED NONURBAN RECREATION AREAS

Type of Use	Administration	Acres Per 1000 Population	Types of Areas
Intensive and Extensive Day Use	Municipal, County, or Metropolitan District	20	Parks, wild areas, monuments, recreation areas, playfields, golf courses, parkways, and trails
Extensive Day, Weekend, and Vacation Use	State	45	Parks, wild areas, monuments, recreation areas, beaches, parkways and trails

Note: Tentative acreage standards suggested by the National Park Service as a guide to planning.

TABLE 10

572. These standards, of course, are not rigid and should of necessity be subjected to modification in areas of population concentration and in consideration of the extent of usable land in the particular area under consideration, within the system as a whole or the geographic region. Modification of these standards should be considered in the vicinity of metropolitan areas where land is less readily available and in the coastal plain sections where the usable portion of recreation lands is great.

573. Considering the Basin as a whole with a population of 6,685,000 (1955), there should be a total of 133,700 acres of nonurban recreation lands devoted to intensive and extensive day-use purposes and administered at the municipal, county, or metropolitan level and 300,825 acres devoted to extensive day, weekend, and vacation use at the State level. In 1958, there was a total of 10,951 acres in the first category and 529,046 acres in the latter. This indicates a gross deficiency of 122,749 acres of nonurban recreation lands available for intensive and extensive day-use purposes and an excess of 228,221 acres in State ownership and available for extensive day, weekend and vacation use.

574. These figures do not, in themselves, present a truly factual picture of the publicly-owned acreage actually available to the population of the Basin and the included study area for nonurban recreation purposes. For example, the county- and municipally-owned acreage are more urban in character than nonurban. These lands represent only one-twelfth of the needs in this category.

575. More important are the apparent excesses that occur in the New Jersey and New York portions of the Basin. Catskill Park, with its 234,610 acres, is compared with the 85,000 population of the New York portion of the Basin which yields an apparent excess of 230,785 acres. In reality, this nonurban recreation area is available, not only to the population of the New York portion of the Basin, but to at least 15 million more people residing in the New York Metropolitan Area, Eastern New York State, and surrounding States. In order to make a true determination of the significance of the acreage of Catskill Park in relation to the contributing population, the total nonurban recreation acreage available to that population would have to be used. Inasmuch as this would cover a considerable area outside the scope of this study, these data are not available. It is important to recognize that the apparent excess in the New York portion of the Basin is in excess only in terms of the population of the New York portion of the Basin.

576. Table 11 indicates an excess of 100,976 acres of nonurban recreation lands owned by the State of New Jersey. This excess occurs only in relation to the population of the Basin and included study area portion of the State. The nonurban recreation areas in the Basin portion of the State are heavily used by residents of Northeastern New Jersey and New York City; therefore, these populations must be included in making any acreage-population determination. Considering only the total population of New Jersey which was 5,359,000 (1955) and the total nonurban recreation lands (182,984 acres) available to this population, a net deficit of 58,171 acres of nonurban recreation lands is revealed for the State as a whole.

577. Table 11 also indicates quite clearly that large deficits of nonurban recreation acreage available for intensive day-use purposes occur in the various geographic regions. The provision of nonurban

ACREAGE-POPULATION RATIO

AREA	POPULATION (Thousands) 1955	INTENSIVE & EXTENSIVE DAY-USE		
		Desirable Min. 20 Ac/1000 Population	Existing Rec. Lands (Acres)	Excess (+) Deficit (-) (Acres)
Upper Basin	499	8,980	6	8,974 -
Allentown-Bethlehem-Reading M.A.	798	15,960	4,604	11,356 -
Trenton M.A.	250	5,000	289	4,711 -
Philadelphia M.A.	4,121	82,420	5,336	77,084 -
Wilmington M.A.	329	6,580	376	6,204 -
Southern Basin	738	14,760	340	14,420 -
TOTAL	6,685	133,700	10,951	122,749 -
New York	85	1,700	6	1,694 -
New Jersey	1,673	33,460	4,649	28,811 -
Pennsylvania	4,530	90,600	5,920	84,680 -
Delaware	397	7,940	376	7,564 -
TOTAL	6,685	133,700	10,951	122,749 -
		EXTENSIVE WEEKEND & VACATION USE		
		Desirable Min. 45 Ac/1000 Population	Existing Rec. Lands (Acres)	Excess (+) Deficit (-) (Acres)
New York	85	3,825	234,610	230,785 +
New Jersey	1,673	75,285	176,261	100,976 +
Pennsylvania	4,530	203,850	109,726	94,124 -
Delaware	397	17,865	8,449	9,416 -
TOTAL	6,685	300,825	529,046	228,221 +

Note: M.A. - Standard Metropolitan Area

TABLE 11

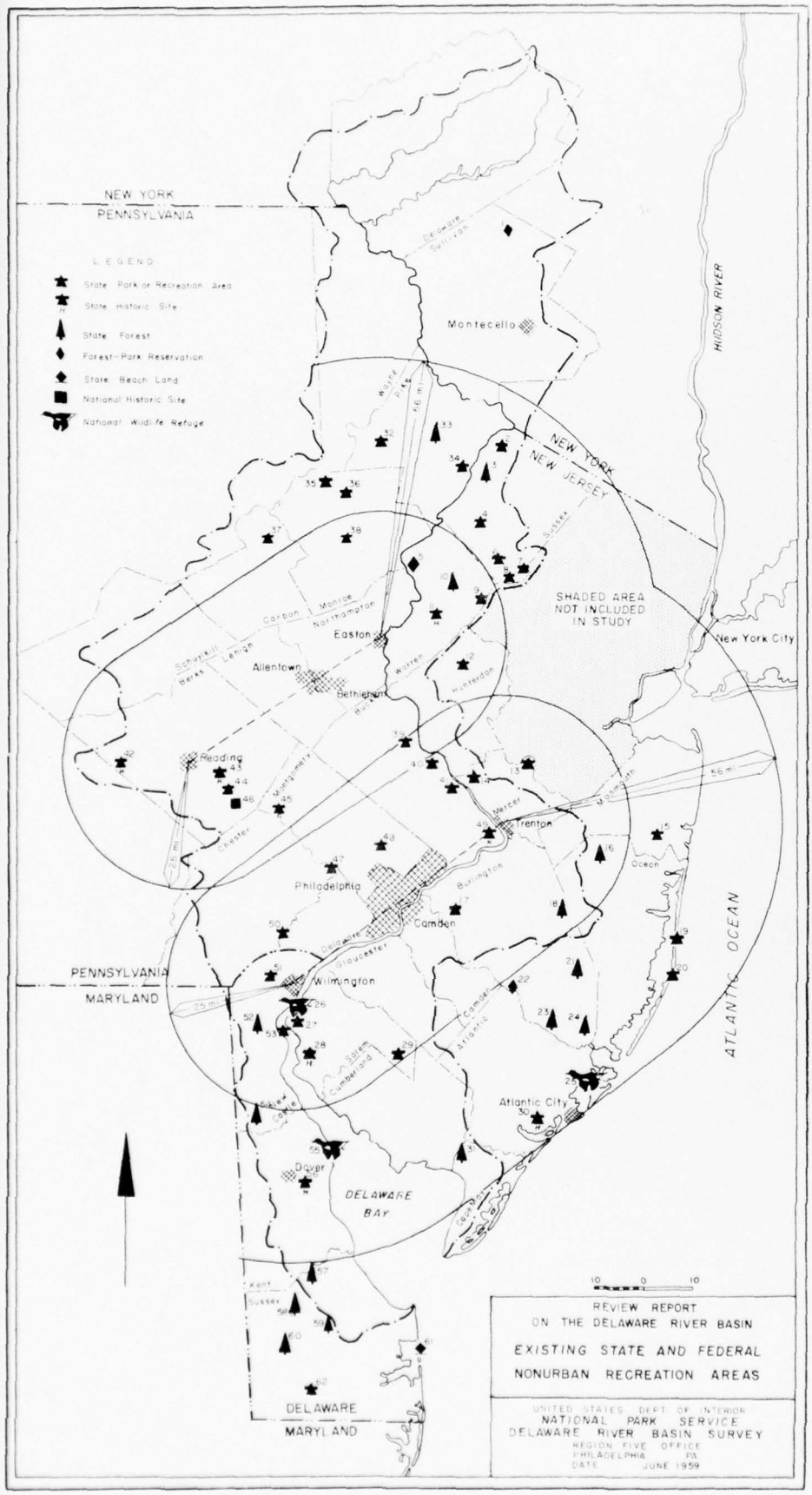


PLATE 7

NONURBAN RECREATION AREAS AND FACILITIES IN RELATION TO POPULATION CENTERS

EASTON-ALLENTOWN-BETHLEHEM-READING METROPOLITAN ZONE (POPULATION 798,000)

		Area (Acres)	Daily Capacity Visitor Day-Use	Daily Capacity Visitor Fa
	25 Mile Radius			
5	Worthington Tract F.P.R.	6,200	0	
9	Stephens S.P.	222	820	
10	Jenny Jump S.F.	967	186	
11	Oxford Furnace S.H.S.	1	0	
12	Voorhees S.P.	429	324	
38	Big Pocono S.P.	1,305	600	
39	Ralph Stover S.P.	44	4,720	
42	Conrad Weiser S.H.S.	26	0	
43	Daniel Boone Homestead S.H.S.	192	240	
44	French Creek S.P.	5,933	20,200	
45	Hopewell Village N.H.S.	848	0	
46	Pottsgrove S.H.S.	1	0	
	SUBTOTAL	16,168	27,090	
	56 Mile Radius			
2	High Point S.P.	10,935	2,764	
3	Stokes S.F.	12,429	585	
4	Swartswood S.P.	704	3,618	
6	Cranberry Lake S.P.	199	Undeveloped	Und
7	Hopatcong S.P.	107	6,584	
8	Musconetcong S.P.	343	300	
32	Promised Land S.P.	2,328	6,600	
33	Delaware S.F.	71,387	558	
34	George W. Childs S.P.	281	1,344	
35	Gouldsboro S.P.	2,800	2,200	
36	Tobyhanna S.P.	7,500	3,100	
37	Hickory Run S.P.	13,386	8,524	
	SUBTOTAL	122,399	36,175	
	TOTAL	138,567	63,265	

TRENTON-PHILADELPHIA-WILMINGTON METROPOLITAN ZONE (POPULATION 4,700,000)

		Area (Acres)	Daily Capacity Visitor Day-Use	Daily Capacity Visitor Fa
	25 Mile Radius			
13	Princeton Battlefield S.P.	40	0	
14	Washington Crossing S.P.(N.J.)	372	1,880	
16	Jackson S.F.	43	0	
17	Mount Laurel S.P.	20	0	
18	Lebanon S.F.	22,185	461	
26	Killcohook N.W.R.	1,362	0	
27	Fort Mott S.P.	104	1,464	
28	Hancock House S.H.S.	1	0	
29	Parvin S.P.	1,025	3,225	
40	Roosevelt S.P.	600	340	
41	Washington Crossing S.P.(Pa.)	478	8,240	
47	Valley Forge S.P.	2,033	1,800	
48	Fort Washington S.P.	493	2,768	
49	Pennsbury Manor S.H.S.	41	0	
50	Brandywine Battlefield S.P.	50	684	
51	Brandywine Springs S.P.	59	1,912	
52	Red Lion S.F.	5	80	
53	Fort Delaware S.P.	60	84	
	SUBTOTAL	28,971	20,918	
	56 Mile Radius			
15	Allaire S.P.	1,170	450	
19	Island Beach S.P.	2,200	3,000	
20	Barnegat Lighthouse S.P.	12	465	
21	Penn S.F.	2,958	177	
22	Wharton Tract F.F.R.	96,000	156	
23	Greenbank S.F.	1,833	48	
24	Bass River S.F.	9,270	1,047	
25	Brigantine N.W.R.	15,942	0	
30	Somers House S.H.S.	- -	0	
31	Bellaplain S.F.	6,492	867	
54	Blackbird S.F.	676	0	
55	Bombay Hook N.W.R.	13,912	0	
56	John Dickenson Mansion S.H.S.	11	0	
	SUBTOTAL	150,476	6,210	
	TOTAL	179,447	27,128	

S.P. State Park
S.F. State Forest
S.H.S. State Historic Site
F.P.R. Forest-Park Reservation
N.H.S. National Historic Site
N.W.R. National Wildlife Refuge

recreation areas has not been assumed generally as a responsibility of the various counties and municipalities. These political subdivisions have relied primarily upon State areas for nonurban recreation space. Several of the counties within the Basin and included study area are now in the planning stage to assume a greater share of this responsibility.

578. In view of the absence of intensive day-use nonurban recreation areas at the county and municipal levels, State acreage that properly should be devoted to extensive day, weekend and vacation purposes has been diverted to supply the much needed intensive day-use space. In fact, a majority of the State parks in the Basin and included study area are little more than day-use parks. With increased nonurban recreation acreage at the county and municipal levels, State areas could more appropriately be administered for extensive nonurban recreation activities.

VIII - FACTORS AFFECTING THE USE OF NONURBAN RECREATION AREAS

579. "Recreation is the pleasurable and constructive use of leisure time. It is a physical and mental need, a necessary relaxation and release from strain. Recreation may be physical, intellectual, emotional, or aesthetic; it may be active or passive; it may be engaged in virtually anywhere and at any time; it is individual, personal, spontaneous, and involves freedom of choice. It comprises all the endeavors in which man participates solely for the enjoyment they afford him. This enjoyment may be transitory or it may be a thrilling experience, the memory of which colors a lifetime. Since that which benefits the individual benefits society, recreation becomes a concern of society."(45)

580. An almost endless list of social and economic factors affecting the extent of recreation activity, whether it be outdoor or indoor, urban or nonurban, could be compiled. For the purpose of this report, only the following major items will be considered: (1) Population, (2) Leisure, (3) Income, (4) Mobility, and (5) Recreation Activities and Preferences.

POPULATION

581. The more people there are in any specific area, the greater, obviously, will be the demand for nonurban recreation. The structure of that population is also a factor to be considered, i.e. the proportion of urban, nonurban or metropolitan dwellers. As pointed out previously, 83 percent of the 6,635,000 Basin population resides within standard metropolitan areas. The population of the Basin is not only predominately urban but metropolitan in character. In terms of total numbers, this means that 5,548,550 residents live within the influence of metropolitan centers. A large proportion of the remaining 17 percent live in Monmouth County, New Jersey, and the remainder of the included study area of New Jersey. The major rural areas are in the Upper Basin and the two southern Delaware Counties.

582. Based on population projections prepared by the Office of Business Economics, U.S. Department of Commerce, the population of the Basin and included study area will increase 50 percent by 1980 and will more than double by 2010. These increases will occur in the highly urbanized section of the Delaware River estuary; however, increases will also occur throughout the Basin with substantial increases anticipated in the southern portion.

583. By virtue of the population structure, the nonurban recreation needs of the Basin are generally synonymous with the nonurban recreation needs of urban (metropolitan) dwellers. Therefore, the needs and desires of urban dwellers with regard to nonurban recreation will necessarily be the primary guide in planning to solve the nonurban recreation problems of the Basin.

584. In considering the total number of persons who will be seeking nonurban recreation within the Basin and included study area, the population of significant areas wholly outside the Basin must be considered. It is impossible to determine the boundary of the gross contributing population on the extent of this population. However certain patterns of activity are identifiable and will serve as indicators of future activities. For example, the nonurban recreation areas of the Northern New Jersey section of the Basin are used primarily by people who come into the Basin from the Northeastern New Jersey Metropolitan Area. Although planning is now under way to provide additional recreation areas closer to this concentration of non-Basin residents, it is doubtful that any reduction in the use of Basin areas will occur.

585. The resorts in the Catskill Mountain section of the Basin are widely known and visitors are attracted from all parts of the country, yet, 95 percent of the users originates in the Greater New York City area. The strictly nonurban facilities provided in the Catskill Park are also used primarily by this same non-Basin population.

586. The Pocono Mountains of the Basin have been described as the most outstanding recreation region of Pennsylvania. The commercial resorts, State parks and forests, and private cottages attract visitors from all sections of Pennsylvania and neighboring States. The significance of the Poconos as a recreation region extends far beyond the Basin boundary and serves a population greatly in excess of the Basin population alone.

587. The seashore of the included study area of the Basin similarly serves non-Basin populations. The beaches of Delaware are favored recreation settings for the residents of such population centers as Baltimore and the District of Columbia, Maryland and Northern Virginia. The planned development of the State-owned beaches will, when accomplished, bring about a still greater impact of non-Basin residents upon these areas.

588. The beaches of New Jersey attract visitors from all parts of the country; however, the greatest impact of visitors originate in the New York-New Jersey Metropolitan Area and the Philadelphia Metropolitan Area within the Basin. In terms of population, the significance of the beaches of New Jersey reaches far beyond the political boundaries of the State and the natural boundaries of the Delaware River Basin.

LEISURE

589. "Leisure and labor are two sides of man's shield; both protected him. Labor enables him to live; leisure makes the good life possible. In the course of social development, various activities changed sides and what was once labor becomes mere sport."(46)

590. One of the most significant trends of the past century concerning recreation is the increased opportunity offered through the decrease of the workweek. At the time of the Civil War, the average workweek was 68 hours, which, together with time necessary for sleeping, eating and personal care, left 16 hours of leisure per week. In 1930, the workweek was 47 hours, and leisure time jumped from 16 hours to 37. By 1950, the 40 hour-week made 44 hours of leisure available. Pressures are now being exerted to bring a 35-hour-workweek into our pattern of life. In addition to reduced working hours, paid vacations and earlier retirement with some assurance of economic independence in older age have increased total leisure by enormous proportions. It appears inevitable that if present trends of increased efficiency of production continue, there will be either shorter working hours or a large percentage of the population not gainfully employed.

591. The "leisure class" was once used to describe an "exclusive way of life - tennis on the lawn, tinkling glasses and silver tea service, servants behind every chair, a horse for every guest and 'the chauffeur will meet you at the station'."(47) Today, leisure class does not identify any particular group or income category. The working man now has time free from work and enough money to do with it as he sees fit. He now enjoys the activities once associated with the managerial, professional, and intellectual groups. In fact the tables have been somewhat reversed: The worker has time off while the executive, by the pressure of an increasingly competitive society, works the longer hours. Some groups of managers, professionals, and intellectuals work almost as long as mill workers did in the nineteenth century.

592. Since the personal income of the Basin population is derived primarily from manufacturing and service industries, it would appear that increased leisure is virtually assured. These industries adhering to a prescribed workday and workweek, are obliged to grant paid vacations and contribute to retirement funds. All of these working conditions contribute to increase leisure now and in the future. Leisure then as a factor influencing recreation activity would certainly indicate that more people will have more time to devote to recreation activities.

INCOME

593. As a factor affecting recreation activity, income is usually associated with leisure. Leisure provides the time requirement and income provides the money considered necessary for the enjoyment of leisure. This has not always been the case. In the past when incomes were low, in proportion to needs, the use of leisure was more often devoted to activities requiring little or no cash outlay. Today, money is considered to be a necessary element in the use of leisure for many purposes. It provides the all-important automobile for transportation and rents parking space, it buys the special equipment and clothing required for each activity, it gains admissions and buys

services considered essential to recreational enjoyment. Without money we would have little use for our ever increasing leisure.

594. One of the great economic changes that has come about in recent times is the lodgement of the bulk of leisure income in the lower and middle income groups.(47) The various income groups spend about the same proportion of their income for leisure and recreation, but the bigger spenders are the professional people, craftsmen, foremen and factory workers. In fact 40 percent of all U.S. expenditures for recreation and recreational equipment are traceable to these groups. The lower income group normally spends more on spectator sports, television and radio than on participant activities.

595. The leisure industry has reached a level of 40 billion dollars annually and consumes one out of every six spendable dollars in the U.S. family budget.(47) The chief item at one time was spectator activities but now the surge is toward individual or participative sports or activities.

596. Personal income as a factor affecting the recreation activity of the Basin population is directly related to the prosperity of Basin manufacturing and service industries. At present, these industries provide a per capita income,that is,11 percent above the national average. With continued industrial prosperity in the Basin, it is reasonable to assume that Basin residents will continue to enjoy an income level permissive of increasing recreational activity.

MOBILITY

597. Mobility as a factor affecting recreation activity refers to the movements of people from one place to another in an effort to satisfy their recreation needs. All forms of modern transportation contribute to the mobility of the population for business or pleasure, but no means of transport has been more responsible for increasing the radius of activities for America than the private family automobile. In fact, 90 percent of recreation travel in the Basin is by means of the family car.

598. Increased mobility has greatly enlarged the field in which people can enjoy their recreation. In a sense, it has increased the number of recreation areas by making available to the average person, the use of areas that previously were beyond their reach. It has also increased the demand for recreation, because the more distant areas can be used only if larger number of people can travel to them.(48) This increased mobility has made it possible for the average family to engage in nonurban recreation activities that were formerly beyond the radius of mass public transportation and to select those areas that most nearly suit their need. In this regard, increased mobility has been a boon to the nonurban recreationist.

599. Some very obvious adverse affects have resulted from increased

mobility. One of the most notable has been the overloading of existing areas and facilities due to increased visitation. The acquisition and development of new areas have not kept pace with the increased rate of visitation. This has resulted in overcrowding to the extent that individual enjoyment is impaired. Overcrowding has been cited as one of the chief deterrents to more frequent use of existing areas.

600. Congested automobile traffic on out-dated highways coupled with poor routes of egress from the metropolitan centers is another adverse effect to increased mobility, and tends to reduce over-all mobility. This condition, coupled with the overcrowding of public recreation sites and the lack of conveniently located areas, are some of the factors contributing to the large number of "backyard recreation areas" being developed on home grounds as a substitute, at least in part, for day outings at the state parks and forests.

601. The very obvious requirements to offset these two adverse affects of increased mobility are additional strategically located and adequately developed nonurban recreation areas and modernized highway systems as well as expressways and trunk routes leading from the metropolitan centers to principal recreation regions. The Interstate Highway System will provide much of the needed highway improvements in the Basin with regard to total volume of traffic and egress from metropolitan centers. These highway improvements will generate greater mobility and place an even greater load upon existing nonurban recreation areas. As mobility increases it is imperative that additional nonurban recreation areas be established and developed to meet this ever increasing demand for more space and more facilities.

602. As a general rule, the more thickly settled a section of the country, the more restricted will be the radius of travel for outings particularly on weekends and holidays. The distance that people will normally travel for outdoor recreation will also vary in accordance with the following: (1) Amount of money available for recreation; (2) Amount of time (leisure) available; (3) Traffic and road conditions; (4) Types of recreational activities available and desired; (5) Availability of satisfactory overnight accommodations; and (6) Degree of crowding in recreation areas.

RECREATION ACTIVITIES AND PREFERENCES

603. In order to determine the recreation habits, activities, and preferences of the population residing in the Delaware River Basin, an original study was made for the National Park Service by the National Recreation School through the facilities of Audience Research, Incorporated. The report of the study was based on a stratified probability sample of the population residing in the geographic basin plus the whole of New Jersey. The findings of this study are as follows:

DAY USE

604. Day outings are primarily family affairs and are engaged in by 71 percent of the Basin population who take a median average of ten

such outings each year. The principal activities in order of participation are visiting friends and relatives, picnicking, going to the beach, swimming, sightseeing in the country and fishing. Swimming and picnicking are the two most desired activities.

605. Nonurban settings are preferred by 60 percent of the Basin residents for these activities; however, the majority prefer surroundings such as would be found at mountain or beach resorts. State parks and forests lead the list of nonurban areas preferred and are followed closely by ocean beaches near to and away from cities. Seven out of ten persons named the New Jersey seashore as their first or second choice of preferred recreation areas for day outings, and eight out of ten gave it as one of their first three choices. The Pocono Mountains and the New Jersey lake region are ranked second and third respectively as locations preferred by Basin residents for day outings.

606. One-way driving distance for day outings, generally, has been considered to be 25 to 50 miles. The survey of the Basin population indicates that the median distance is 63 miles and the median time for one-way travel is two hours. The two most popular day-use regions, the Pocono Mountains and the New Jersey seashore, fall within this median distance or time for a large proportion of the Basin population.

WEEKEND OR OVERNIGHT

607. Recreation outings of more than one day's duration and requiring an overnight stop were engaged in by 47 percent of the Basin residents during the year preceding October 1957. A median average of three overnight or weekend trips were taken.

608. This type of outing is, of course, directly related to overnight accommodations. Motels, privately owned cottages or summer places and,hotels are the order of rank of the types of accommodations used and preferred for weekend outings. Nearly half of those who use private cottages and summer places do so while visiting friends and relatives.

609. There is virtually no difference in the activities engaged in while on weekend outings compared to day-use activities. Swimming and going to the beach lead the list of activities desired.

610. Seventy-eight percent of weekend recreationists and 42 percent of the Basin population prefer rural scenes for weekend outings yet six out of ten prefer to have other people around such as would be encountered at mountain or beach resorts. Ocean beaches lead the list of places visited for weekend purposes, while state parks and forests have been visited by only 9 percent of the total. Sixteen percent would like to have State parks and forests available for weekend outings. The specific geographic locations listed in order of preference for weekend outings are the New Jersey Seashore, Pocono Mountains, and Catskill Mountains. These three locations account for 84 percent of the first choices.

611. One hundred and twenty miles or three hours of driving time are the median distance and/or time that Basin residents are likely to drive one way for weekend outing purposes. The two most popular areas, the New Jersey Seashore, and the Pocono Mountains fall well within this time or distance measure.

VACATION

612. July and August are vacation months for Basin residents, 58 percent of whom receive some vacation time each year. Two weeks is the median period. Forty-five percent of the vacationers spent some time at the New Jersey Seashore during the year prior to October 1957. This represents 24 percent of the population. The Pocono and Catskill Mountains each received only 3 percent of the Basin population during the same period.

613. Areas outside the Delaware River Basin are generally more attractive for vacation purposes. The most desirable region within the Basin is the New Jersey Seashore where 77 percent of Basin residents have vacationed at one time or another.

614. State parks or forests have been used for vacation purposes by 14 percent of the Basin population within the last five years. Publicly-owned vacation areas are preferred by 31 percent of the population and privately-owned areas are preferred by 29 percent; however, if suitable publicly-owned areas with adequate facilities such as lodges, cabins, beaches, campsites, etc., were available approximately 56 percent of the population could be expected to use these areas for vacation purposes. Publicly-owned areas would probably be more appealing if consideration were given to the gregariousness of Basin residents who prefer to vacation in relatively close association with other people.

615. The four activities most desired while on vacation are directly related to water, i.e., swimming, going to the beach, fishing, and boating.

616. Overnight accommodations most often used while on vacations are privately-owned cottages or summer places, motels, rental cabins or cottages, and hotels in that order. Nearly half of those who use privately-owned cottages do so while visiting friends and relatives. Motels are the most popular commercial overnight accommodations.

CAMPING AND BOATING

617. Camping is not a major activity in proportion to the population of the Delaware River Basin. Fifteen percent of the residents are interested in tent camping, however, this activity was engaged in by 1 percent of the population while on their vacation during the year prior to October 1957. For weekend purposes camping was done by 3 percent and preferred by only 2 percent.

618. Thirty-four percent of Basin residents are interested in boating as a form of nonurban recreation but only 5 percent now own boats used for pleasure. Eighteen percent of the nonboat owners think that they would probably purchase a pleasure boat if suitable bodies of water were available.

IX - NONURBAN RECREATION REQUIREMENTS

619. Considering the foregoing factors that affect over-all recreation activity, the nonurban recreation needs of the Basin are concerned with recreation space, recreation facilities and accessibility. In fulfilling recreation needs, space, a place to play, is the basic requirement. Space without facilities serves only as a recreation land or water reserve. Recreation areas with inadequate access do not serve the people. The fulfillment of those requirements would solve the nonurban recreation problems of the Basin population.

SPACE

620. The factor of nonurban recreation space implies total acreage available for nonurban recreation purposes and includes both land and water space. It is difficult to express such needs quantitatively and to derive them by means of formulae. The factors which influence such needs are extremely variable and the interaction among them is not fully understood at this time. However, in the present study, some degree of quantitative analysis has been developed as a means of weighing recreation aspects on a basin-wide scope.

621. Many factors have been used from time to time as guides in planning for the fulfillment of space requirements. At one time, 10 acres per 1,000 population were considered adequate for nonurban recreation purposes at the state level of ownership and administration. This figure has moved steadily upward as experience has shown the figure to be grossly inadequate. For the purpose of this study, 45 acres per 1,000 population is being used as a planning guide to determine the total acreage needed for nonurban recreation purposes. This figure would include acreage devoted to state parks, wild areas, monuments, historic sites, recreation areas, beaches, and parkways. A figure of 20 acres nonurban recreation space per 1,000 population is used as a planning guide to determine the over-all space requirements at the county, municipal or metropolitan district level of ownership and administration. This figure would include nonurban parks, wild areas, monuments, recreation areas, playfields, golf courses, parkways and other areas located outside urban limits.

622. A comparison of the relationship between desirable nonurban recreation acreage and population on the basis of the above have been made on pages 97-100. Table 11 is an analysis of this comparison. On the basis of 45 acres of nonurban recreation space per 1,000 population, the State of Delaware and the Basin portion of Pennsylvania have deficits of 9,416 acres and 94,124 acres in relation to their respective Basin populations. As outlined in paragraphs 575 and 576, the New Jersey and New York portions of the Basin show an excess of 100,976 acres and 230,785 acres respectively of nonurban recreation lands in relation to their respective Basin

populations. However, when the proximity of these nonurban recreation lands is related to the large user-oriented population of the metropolitan areas of northeast New Jersey and New York City, a deficit results. If consideration is given to the total population of New Jersey, a deficit of 58,171 acres of nonurban recreation space becomes apparent. Likewise, if consideration is given to the New York portion of the New York City metropolitan area, a deficit of 174,206 acres of nonurban recreation lands results.

623. On the basis of 20 acres of nonurban recreation lands per 1,000 population, Table 11 indicates a gross deficit of 122,749 acres at the municipal, county, or metropolitan district level of ownership and administration. It will be noted that no section of the Basin approaches the desirable minimum.

LAND

624. The character of the land designated for nonurban recreation should of necessity vary with the purpose for which the area is reserved. For example, state park areas normally contain outstanding natural features of state-wide significance including landscapes, waterfalls, mountains, gorges, geological formations, etc. Recreation areas contain a high percentage of usable land for intensive recreation purposes where the emphasis is placed on accommodating large numbers of visitors primarily on a day-use basis. Land reserved for public hunting should be relatively wild, unimproved and offer the best wildlife habitat available. Historical areas are concerned with the preservation of sites and structures associated with a particular historical event, era or person. However, few areas are administered as exclusive single purpose areas. The shortage of public lands suitable for nonurban recreation has required the multiple-purpose management of most public lands. Many State parks double as day-use recreation areas. State forests provide diversified recreation activities. Historic sites offer picnicking in addition to historical sightseeing. Public hunting is permitted in portions of some state parks and in most state forests.

625. The rate at which land is being occupied for other than recreation purposes, places recreational use of land in a competitive position with a number of other uses. In view of land prices and the scarcity of good recreation sites, particularly in the vicinity of large urban centers, it becomes imperative that the greatest possible benefit be realized from present recreation areas as well as those to be acquired. This necessitates the extraction of the greatest possible recreation benefit from all lands reserved for total nonurban recreation activities.

626. A recreation land problem of particular concern in the Basin is the use of land areas for purposes for which they are poorly suited. The concentration of visitors in areas too small to absorb the impact has resulted in site deterioration, gross overcrowding, erosion, soil compaction, unsanitary surroundings, and a general deterioration of recreation values all of which adversely affect



Levittown, Pa., an example of "urban sprawl".



"Urban sprawl" along the seashore uses potential public beach space.

visitors enjoyment. Areas that have been established primarily for their scenic values have been cluttered with stopgap facilities in an effort to meet the increased visitor load with resultant deterioration of the scenic features. Day-use facilities have been introduced into historically significant areas to the detriment of the historic scene. As the visitor load has increased, other suitable land areas have not been developed to absorb the impact.

627. In view of the tremendous concentration of people in the Delaware River Basin, the greatest requirement for nonurban recreation purposes is usable land. This refers to acreage capable of absorbing large numbers of visitors on weekends and holidays and in areas of such size as to provide the nonurban setting desired. This means space for picnicking, beach space, parking areas, public service buildings, space for trails, scenic surroundings, and freedom from crowding. This "usable land" must of necessity be of such topographic character that it will be adaptable to mass use.

WATER

628. "Lakes and flowing waters are to recreation what bread is to the American table. Gravitation of people to riverbank, lakeside, and ocean on every pleasant holiday is sufficient proof of this. Bodies of water are man's richest heritage of play. For use and enjoyment, they need only be kept clean and accessible."(49)

629. "Water is a 'piece de resistance' of outdoor recreation. A rural park without water is a dull thing. A river, or lake, or bay accessible and in good condition, is a park in itself. There is something in water recreation for all people of all ages - something for the eye, the body and the mind - something of aesthetic, physical and intellectual value - and not to be overlooked, much of commercial importance."(50)

630. Today, the availability of a water area is considered the most fundamental requirement in the development of nonurban recreation areas. This is not a new idea in recreation but an expression of a natural attraction that water holds for those who are seeking active or relaxing recreation pursuits. The oldest resorts and vacation centers in this country were located in close proximity to water, either lake, river, or ocean.

631. No formula has yet been devised for the determination of recreation water requirements for a given unit of population. These requirements can not be measured in gallons, acre feet, surface acres, depth in feet or length of shoreline, yet all of these factors, in one way or another, must be considered in determining the suitability of a water body for recreation. One additional, all important, factor - water quality - must always be considered first.

632. For purposes of nonurban recreation, natural water areas

such as lakes, streams, or seashores, normally provide the more pleasing environments. Here the natural setting and aesthetic values add their weight to the recreation values of the water itself. Wherever possible, natural water areas should be selected for recreation development in preference to artificial areas, other factors being equal. This by no means infers that artificial impoundments should not be given full consideration as potential recreation areas. In the Delaware Basin, the construction of water impoundments or the development of recreation activities of existing impoundments appears to be the only reasonable solution of the need for recreation water. In fact, the construction of water control structures for the sole purpose of creating recreation water has proven to be entirely satisfactory. Here, the control of the water level is of prime importance.

633. Some of the more important characteristics which make a lake, natural or artificial, useful for recreation are the following: The water should be clear and pure; sufficient depth of water for desired activities; fairly constant water level; adequate size to afford aesthetic values; diversified shoreline; land of suitable topography and vegetative cover adjacent to the water area.

634. Lakes or impoundments near the head of watersheds, above sources of industrial and domestic pollution are usually clear and sufficiently pure for recreation purposes. The flow of feeder streams must be adequate to avoid stagnation. The maintenance of adequate water quality is a continuing problem.

635. For general water recreation activities depths in excess of 6 to 8 feet are not essential. Depth, however, becomes an important factor in those regions where excessive warming occurs and a comfortably cool water temperature cannot be maintained by natural recharge. Shallow lakes tend to become warm, permit light to penetrate to the bottom, and encourage the growth of algae and other aquatic plants. These factors are favorable to some fish species but they create undesirable conditions for swimming, boating, and other water sports. The ponds in the State of Delaware are examples of shallow water bodies that become undesirable and little used during the height of the summer, primarily because of water temperature and the presence of algae.

636. The water level should be fairly constant. Natural lakes are usually more stable than reservoirs in this regard. Reservoirs operated primarily for hydroelectric power, irrigation, or flood control are quite often subject to heavy seasonal fluctuations. When the drawdown coincides with the intensive recreation period, the recreation values in most instances are affected and problems in connection with facility development, maintenance and administration increase. In those reservoirs where recreation is planned, it is essential that the expected period of intensive recreation activity be taken into account in working out the operational plan to provide for the maintenance of a satisfactory water level during that period.

637. Size of a lake or reservoir in gross surface area is an important factor in proving the desired aesthetics associated with nonurban recreation. Fishing can be done in a small pond and artificial pools can be provided for swimming, but neither provides the aesthetic values associated with a large expanse of open water with its tree-lined shores and sandy beaches.

638. The outline of the lake or reservoir should be pleasing. Diversified shorelines with bays, necks, points, and flat-topped promontories partly encircled by and overlooking coves and arms of the lake are particularly desirable.

639. The topography and vegetative cover of the land surrounding the water area is of great importance. If a water area is expected to serve a large number of visitors at one time, the need for relatively level, strategically located shorelands becomes apparent. This could be termed "usable land", or land that would be adaptable for the placing of necessary facilities. These developed areas separated by topographic features add variety, interest, and spaciousness to the over-all area.

640. A forest cover of mature trees is a highly desirable feature in conjunction with a water recreation area. A certain amount of openness in the forest adds variety and provides space for playfields, parking areas, and visitors centers. Tree cover is considered essential for picnic and camping areas.

PHYSICAL FACILITIES

641. The need for appropriate recreation facilities throughout the Basin is most pressing. It would be difficult to determine the exact number of picnic units, the square feet of beach space, the number of campsites, the number of vacation cabins, the number of boat launching sites, or similar facilities to meet the needs of such a densely populated region. This becomes increasingly difficult in view of the fact that ample public facilities have not been available. The population has relied primarily upon facilities provided by private enterprise. The obvious result has been a retarded growth of nonurban recreation interest. Yet, wherever public nonurban recreation facilities have been made available, they have been used far beyond their capacity. For example, one public area with facilities for a day-use visitor capacity of 300 has received as many as 1,200 visitors and a state park with day-use facilities for 20,000 has received 50,000 visitors in a single day. The requests for vacation cabins far exceed the number available and reservations are made months in advance.

DAY-USE FACILITIES

642. The greatest single need for nonurban recreation facilities in the Basin is for day-use activities in the vicinity of metropolitan

areas. In every nonurban recreation area within the Basin, day-use facilities are overtaxed on normal Sundays, and holidays bring even greater crowds. Picnicking and swimming facilities are the ones primarily sought.

643. The relationship between day-use facilities for picnicking and swimming and population is shown in Plate 7 . It is significant to point out that in the Easton-Allentown-Bethlehem-Reading Metropolitan Zone, existing State and Federal nonurban recreation areas have picnic and swimming facilities to accommodate 8 percent of the population. Considering the Trenton-Philadelphia-Wilmington Zone, only .06 percent of the population can be accommodated for these activities in existing publicly-owned nonurban recreation areas. The great deficiency in this regard is pointed up by the fact that 38 percent of the population would like to engage in swimming and 34 percent in picnics while on day-outings.(44)

WEEKEND FACILITIES

644. Approximately 80 percent of all day-use activity occurs on weekends. Therefore, facilities provided for day-use visitors can also serve weekend visitors. Swimming is the most desired recreation activity, followed closely by fishing and boating. Weekend recreationists, i.e., those who stay overnight, are less prone to picnic than day-use visitors.

645. Weekend use necessitates lodging and eating accommodations. In fact, good sleeping and eating facilities such as hotels, motels, and restaurants are considered the chief requirements for a satisfactory weekend outing by the population of the Basin.(44)

646. The responsibility of government agencies in providing lodging and eating facilities in public nonurban recreation areas has often been a point of argument and disagreement. Permanent facilities such as hotels, lodges, motels, and family unit cabins are normally provided by private enterprise and the population of the Basin has been dependent upon these facilities for weekend outings. Some State areas do have such facilities available for weekenders; however, the total capacity is negligible in proportion to the population of the Basin. Camping areas primarily for tent campers is considered a more appropriate overnight facility in nonurban recreation areas. The requirements for camping are discussed in a later paragraph.

VACATION FACILITIES

647. Facilities for vacations usually consist of major installations such as hotels, lodges, motels, and cottage colonies that necessitates large investments in capital improvements. Although these developments are found in some nonurban recreation areas, it has not been a policy of the Basin State to provide this

general type of facility. Private enterprise has developed extensive vacation facilities in the Pocono and Catskill Mountains resort regions, the New Jersey lake country and the seashores of the included study area in New Jersey and Delaware. The provision of facilities equal in type and/or quality are normally considered inappropriate to public nonurban recreation areas, within the study area, such as state parks and state forests.

648. Family unit vacation cabins are available in several state parks and forests and have proven to be in great demand for vacation purposes. Only a small fraction of the requests for this type of facility can be filled each year due to the limited number available. In view of the moderate rental rate and the generally pleasing setting in which these units are normally placed, it is apparent that additional units would receive wide public acceptance and considerable use.

649. Vacation facilities for other than tent camping are considered to be a luxury and not suited to nonurban recreation areas. Such facilities are extremely costly, utilize considerable space, monopolize desirable sites, and are selective in clientel in proportion to the number of visitors that could be served by other facilities and types of activity. However, it can be predicted with reasonable assurance that vacation facilities of a general resort type in the State parks and forests of the Basin would receive extensive patronage as long as the cost involved remained at a reasonable level.

CAMPING

650. Interest and participation in camping have shown tremendous increases throughout the United States in recent years and many State and Federal agencies have experienced difficulty in providing an adequate number of campsites. This has not been particularly true in the Delaware River Basin. During 1957, 3 percent of the Basin population used tent camping as a means of overnight accommodation while on weekend outings. However, camping as an activity was preferred by only 2 percent. For vacation purposes, tent camping was preferred by 2 percent, but used by only 1 percent. Only 15 percent of the Basin population has indicated an interest in tent camping. Field observations made during the course of this study confirm these low figures. An analysis of 1958 campsite-use in areas administered by the Pennsylvania Department of Forests and Waters indicate campsite occupancy considerably below the maximum.

651. At least one significant factor contributes to this lack of interest and low percentage of participation in camping and that is the quality of available camping areas and facilities. At best, camping facilities in the Basin would be classified as barely adequate to primitive. The modern camper is looking for and expects to find more than an unimproved site on which to pitch his tent. Modern sanitary installations, improved tent sites, laundry and

shower facilities, recreation water, play apparatus for children and related modernizations are considered by many as the bare essentials for enjoyable camping. The pit toilet and pitcher pump are no longer adequate. It is a certainty that modernization of existing camping areas would result in a more wide spread participation in tent camping and at the same time contribute to the enjoyment of this all-important recreation activity.

BOATING

652. In proportion to the population of the Basin, boating is a relatively unimportant recreation activity. Only 5 percent of the population owns boats used primarily for pleasure; however, 34 percent is interested in boating as a form of outdoor recreation.(44)

653. There are rather obvious reasons for this lack of participation in boating - poor recreation water as the result of continued pollution and the absence of suitable large inland water bodies. Pollution abatement in the principal streams of the Basin, particularly in the southern portion, has resulted in a significant increase in the number of recreation boats, and with continued improvement in water quality, it is reasonable to assume that this activity will in a short time assume enormous proportions.

654. The facilities for recreation boating have not kept pace with the increase in number of boats. Existing marinas, yacht clubs and boatyards on the inland rivers are for the most part antiquated and inadequate to meet the needs of boat recreationists. In the salt water areas of the included study area, boat and yacht facilities are of better quality, but are inadequate in berthing space and services during the active summer season. The State of New Jersey is completing the Atlantic City State Marina and the State of Pennsylvania has a marina project in the planning stage for the Delaware River at the mouth of Neshaminy Creek north of Philadelphia.

ACCESSIBILITY

655. Good accessiblity to nonurban recreation areas is a fundamental requirement if these areas are to serve the public. Accessibility means not only a road leading to a particular area but includes all the roadways separating the area for the potential user. Adequate access might include urban expressways for escape from the city, turnpike, thruways or parkways through the suburban and rural sections and connecting with trunk highways leading to recreation regions.

656. The Garden State Parkway is an example of a "recreation trunk highway". Connecting with the New York Thruway and the New Jersey Turnpike, the Parkway extends the full length of the New Jersey Seashore and terminates in a dead end at Cape May. This limited access, high-speed, dual lane highway provides access to

all the New Jersey Seashore resort areas and brings them closer to Greater New York area.

657. Over-all accessibility is being improved throughout the Basin. The Interstate Highway System will materially improve access routes leading to the Pocono Mountains from the Metropolitan New York-New Jersey section and from cities located west of the Basin in Pennsylvania. New York State is now improving State Route 17 leading into the Sullivan County resort region of the Catskills. This four-lane, limited access highway will bring this area within 2 hours driving time of Times Square. The Northeast Extension of the Pennsylvania Turnpike has brought the Pocono Mountains within day-use driving time and distance of the Philadelphia Metropolitan Area.

658. The greatest need for improved accessibility is between the Philadelphia Metropolitan Area and the New Jersey Seashore and access routes to the Delaware Seashore. Tentative plans have been prepared for the general improvement of both of these unfavorable access situations.

X - NONURBAN RECREATION PLAN - DELAWARE RIVER BASIN

659. In view of the relatively small size of the Delaware River Basin, a recreation plan for the Basin and included study area as a unit would be the most feasible approach in any attempt to solve over-all nonurban recreation problems. However, since the development and administration of nonurban recreation areas is a function of the respective States and their political subdivisions, the recreation plan for the Basin, as presented herewith, is divided into five sections, one for each Basin State, and the area of Federal responsibility.

OBJECTIVE

660. The purpose of the plan is to indicate ways and means of meeting the nonurban recreation needs of the population of the Delaware River Basin in terms of the present and foreseeable future. It provides for the preservation of areas to be used primarily for intensive day-use participation type activities, historic sites, natural areas and areas of natural and scenic significance to be designated as State parks or recreation areas.

METHODS

661. The objectives of this plan can be accomplished through the following methods: (1) The improvement of existing recreation areas; (2) The acquisition and development of new areas; and (3) The immediate acquisition and deferred development of recreation land reserves.

IMPROVEMENT OF EXISTING RECREATION AREAS

662. The optimum development of existing publicly-owned areas consistent with the available resources is the logical point of beginning in planning to meet nonurban recreation needs. This requires a careful analysis of the recreation resources of each existing area and a determination of the ability of those resources to serve the needs of the contributing population. Recreation resources would include over-all acreage, recreation water in the form of a lake, reservoir, seashore or large stream, extent of usable land, vegetative cover, topographic variety, and scenic, historic, or scientific values.

663. The ability of existing areas to meet the nonurban recreation needs of the Basin population will vary with the individual areas. Some areas have extensive acreage, ideal topography but limited recreation water. In other areas the situation is reversed. Many existing State parks are too limited in size and resource to serve other than strictly local needs. At least two areas designed as State parks are totally undeveloped while others are only partially developed. An inventory of the resources of all existing areas and a determination of the potential of each area in fulfilling nonurban recreation needs is the logical first step. It will be found that significant increases in visitor use

can be achieved in certain areas, while decreased attendance in other areas would be desirable. The transfer of some State areas to a county or a municipality would permit State agencies to concentrate on large areas serving a greater portion of the State.

664. The answer to the needs of the Basin population for nonurban recreation space and facilities will not be found solely in existing publicly-owned nonurban parks or recreation areas. A bold program of acquisition and development of additional areas is urgently needed.

ACQUISITION AND DEVELOPMENT OF NEW AREAS

665. The acquisition and development of additional nonurban recreation areas capable of accommodating large daily visitor loads constitutes the bulk of the Basin recreation plan. However, new areas are also recommended because of their particular scenic, historic, biological or scientific qualities. The areas recommended for acquisition and development are those which would directly serve nonurban recreation purposes, historic sites, natural and scientific areas. Fish and wildlife areas, forests, games refuges, and related areas have not been considered since recreation use of those areas fall within the purview of other agencies participating in this study.

CRITERIA FOR THE SELECTION OF AREAS

666. The criteria for the selection of areas included within this plan for the Basin has followed, in a general way, the Suggested Criteria for Evaluating Areas Proposed for Inclusion in State Park Systems as Adopted by the National Conference on State Parks.

667. State recreation systems usually consist of areas of scenic, historical, scientific, archaeological or other recreation significance of statewide importance, or at least of sufficient importance to attract visitors from a large section of the State. Each system should contain outstanding examples of the State's natural and cultural resources for the inspiration and benefit of the public and provide nonurban recreation opportunities for the State's citizens and visitors. Each area within the system should contain unique or high quality features of interest.

668. There is no uniformly accepted classification for State park areas. Some States use the term "state park" generically, and apply it to all areas of their system without regard to size, quality or purpose. For the sake of clarity, the following definitions will apply as used in this plan:

State Parks: Relatively spacious areas of outstanding scenic or wilderness character, oftentimes containing also significant historical, archaeological, ecological, geological, and other scientific values, preserved as nearly as possible in their original or natural condition, and providing opportunities for appropriate types of recreation where such will not destroy or impair the features and values to be preserved. Commercial exploitation of resources is prohibited.

State Historic Sites: Areas usually limited in size, established primarily to preserve objects of historic or scientific interest, and commemorating important persons or historic events. The only facilities usually provided are those required for the safety and comfort of visitors such as access roads, parking, water, sanitation, interpretive devices, and sometime facilities for picnicking and other recreation activities.

State Recreation Areas: Areas selected and developed primarily to provide nonurban recreation opportunities to meet other than local needs and having the best available scenic quality. Hunting and other recreation activities not usually associated with state parks may be permitted. Commercial exploitation of resources is prohibited.

State Beaches: Areas with frontage on the oceans, lakes, and streams designed primarily to provide swimming, boating, and other waterfront activities. These areas may be classified as state seashore or beach parks.

Nature Preserve: Areas often limited in size, established for the purpose of preserving distinctive natural communities of plants and animals, for their scientific and aesthetic interest.

Waysides: Relatively small areas along highways selected for their scenic or historical significance, ease of access and development, and providing an opportunity for the traveler to relax, enjoy a scenic view, read an historic marker, or have a picnic lunch. These areas are usually administered by a highway department; however, the larger and more spacious waysides may be administered as units by a state park system.

669. With regard to the above definitions, the following criteria have been applied in the selection of areas for acquisition and development.

State Parks: State significance exists in inspirational landscape and wilderness values that would attract visitors from all sections of the State, and perhaps outside the State or which would in the foreseeable future possess such qualities and attractiveness if adequate protection and access were made available, and areas that are adjudged as best exemplifying the natural landscapes of the major physiographic provinces of the State. An important factor is adequacy of area and boundaries to include reasonably consolidated physiographic units to permit proper protection, development, and administration.

State Historic Sites: The prime requisite is historical or scientific significance. The chief determining factor is that the site or structure must possess certain important historical associations which entitles it to a position of high rank in the history of the state or the nation, or in the case of a structure, must in itself be of sufficient antiquity and artistic or architectural significance to deserve a position of high rank, even though not having other important historical associations.

State Recreation Areas: Primary factors in the selection of recreation areas are adaptability for providing recreational opportunities and location with respect to population centers. However, with the limits imposed by these two considerations, scenic and inspirational values have been given every consideration. Selection has been based upon the suitability of the area for the kinds of recreation uses intended and the practicability of developing required facilities.

State Beaches: Because of the present and future need for public beaches and because remaining suitable beach lands are being rapidly acquired and developed by private interests, all undeveloped sizable beach areas on the ocean have been considered.

Nature Preserves: Since natural scenery and distinctive natural communities of plants and animals are where nature put them, selection has been made of those areas that best portray exhibits of the various types of natural scenery, objects, phenomena, plant or animal life that is not otherwise protected and made available to the public.

Waysides: The specific locations of waysides in the Basin have not been included in this plan. However, the following considerations should be made in the selection of sites for wayside purposes. Areas may be selected for their unusual and interesting scenic, scientific or historic features regardless of location or interval. Other areas, which are designed primarily to provide places to picnic or to rest and relax are usually selected on some mileage basis. Within a distance of 5 miles of the desired interval, the more scenic areas should be selected. Existence of mature trees and other vegetation is highly desirable. Availability of sufficient space to permit desired developments without crowding - usually from 1 to 5 acres - is important.

RECREATION LAND RESERVES

670. Recreation land reserves may be defined as land and/or water areas of potential recreation value that have been set aside for development at a later date. These reserves may contain the necessary features to qualify as state parks or recreation areas.

671 If suitable nonurban sites are to be available for the use of future generations, it is imperative that public land holdings of recreation reserves be created as a continuing function. Desirable land and water areas are being appropriated for private and industrial purposes at an alarming rate. In the words of Frederick Lewes Allen (51), "I suggest as first order of business.....a consideration of ways and means for preserving open land for the benefit of succeeding generations. For the change to the greater metropolitan region is upon us. We cannot stop it. We can only channel and direct it. And we cannot do that, unless we act in good season. For it is later than you think."

ADMINISTRATION OF NONURBAN RECREATION AREAS

672. It has long been recognized that recreation benefits the

individual and that which benefits the individual also benefits society by promoting the general welfare of all the people. Therefore, recreation becomes a concern of government - government at all levels.

673. It is assumed that the administration of nonurban recreation areas proposed in this plan would fall within the authority of existing government agencies now concerned with the acquisition, development, maintenance, and operation of similar projects.

FEDERAL GOVERNMENT

674. The role of the Federal government in the administration of nonurban recreation areas is generally confined to areas of broad regional or national significance, and this plan includes an area that is considered to be of such significance as to warrant administration by an agency of the Federal Government. Where such recreation may be in conjunction with a multiple-purpose land or water project under Federal administration, even though of less than national significance, the Federal government does provide and maintain access, and facilities necessary for the recreational use of the area and for safety and the protection of the health of the visiting public where appropriate.

STATE GOVERNMENT

675. The administration of nonurban recreation areas of less than national significance and of primary interest to the residents of a particular State are considered to be a responsibility of State government and its political subdivisions. Except as noted above, it is recommended that the remainder of the plan be administered by an appropriate agency of the respective State governments.

METROPOLITAN OR REGIONAL PARK ORGANIZATIONS

676. Since no regional or metropolitan park organization exists in the Basin, the plan does not include areas to be administered by such organizations.

677. In view of the rapid growth of large cities in the Basin and the resulting complex of boroughs, townships, and county governments, a metropolitan or regional park organization for the administration of nonurban recreation areas and activities in the metropolitan areas of the Basin is considered highly desirable. In fact, the coordinated planning, development and administration of nonurban recreation areas in these highly urbanized regions appear to be the only reasonable solution to a very complex problem.

678. It is recommended that metropolitan or regional park organizations be created in the following areas: (1) Philadelphia Metropolitan Area, to include the City of Philadelphia, Bucks, Chester, Delaware, and Montgomery Counties; (2) Camden, Burlington and Gloucester Counties,

New Jersey; (3) Trenton and Mercer County, New Jersey; (4) Wilmington and New Castle County, Delaware; (5) Allentown-Bethlehem-Easton Metropolitan area to include Lehigh and Northampton Counties, and (6) Reading and Berks County, Pennsylvania.

COUNTY GOVERNMENT

679. No provision is made in this plan for the administration of proposed nonurban recreation areas at the county level of government; however, recommendations have been made for the transfer of some existing State areas to the county in which the individual area is located.

680. For the most part the counties of the Basin have not been active in providing nonurban recreation opportunities for their citizens. It is recommended that counties not having park or recreation organizations determine the possibility and desirability of creating such agencies whose responsibility would be the acquisition, development, and administration on nonurban or other recreation facilities within the respective counties for the purpose of providing space and facilities close at home for less than full day outings.

MUNICIPALITIES

681. No provision is made in this plan for the administration of proposed nonurban recreation areas at the municipal level of government.

682. For the most part, the municipalities that have park and recreation agencies are concerned primarily with urban recreation facilities and have not developed areas outside their corporate limits. It is recommended that municipal park and recreation organizations be established where lacking and that the desirability and feasibility of providing nonurban recreation facilities close at home be thoroughly explored.

PHASING OF THE PLAN

683. Each State section of the Basin plan is divided into two parts or phases for acquisition and development of nonurban recreation space and facilities.

684. PHASE ONE is concerned with the fulfillment of nonurban recreation needs of the present and to the year 1980. This is to be accomplished by the development of existing State-owned land and water areas, the acquisition and development of additional areas, and the acquisition of recreation land reserves for development between 1980 and 2010.

685. PHASE TWO contains brief description of selected areas that are considered to have significant value for nonurban recreation. These and other suitable areas should be acquired as a part of Phase One and developed during the period 1980 to 2010.

RECOMMENDED FEDERAL PARTICIPATION IN THE DELAWARE RIVER BASIN RECREATION PLAN (See Plate 10 following page 139)

686. The studies and investigations conducted in the Delaware River Basin have revealed that nonurban recreation opportunities in areas administered by the Federal Government are extremely limited. The existing Federal areas, including those administered by the National Park Service and the Fish and Wildlife Service, were established because of their outstanding historic and wildlife values respectively. The provision of extensive nonurban recreation facilities would violate their primary purposes and values or would be impractical.

687. The Federal Government has normally assumed the responsibility for the preservation and administration of nationally significant recreation resources as found in National Parks and National Wildlife Refuges. However, such projects as seashore erosion control, the Intercoastal Waterway, Chesapeake and Delaware Canal, and flood control impoundments contribute to nonurban recreation opportunities.

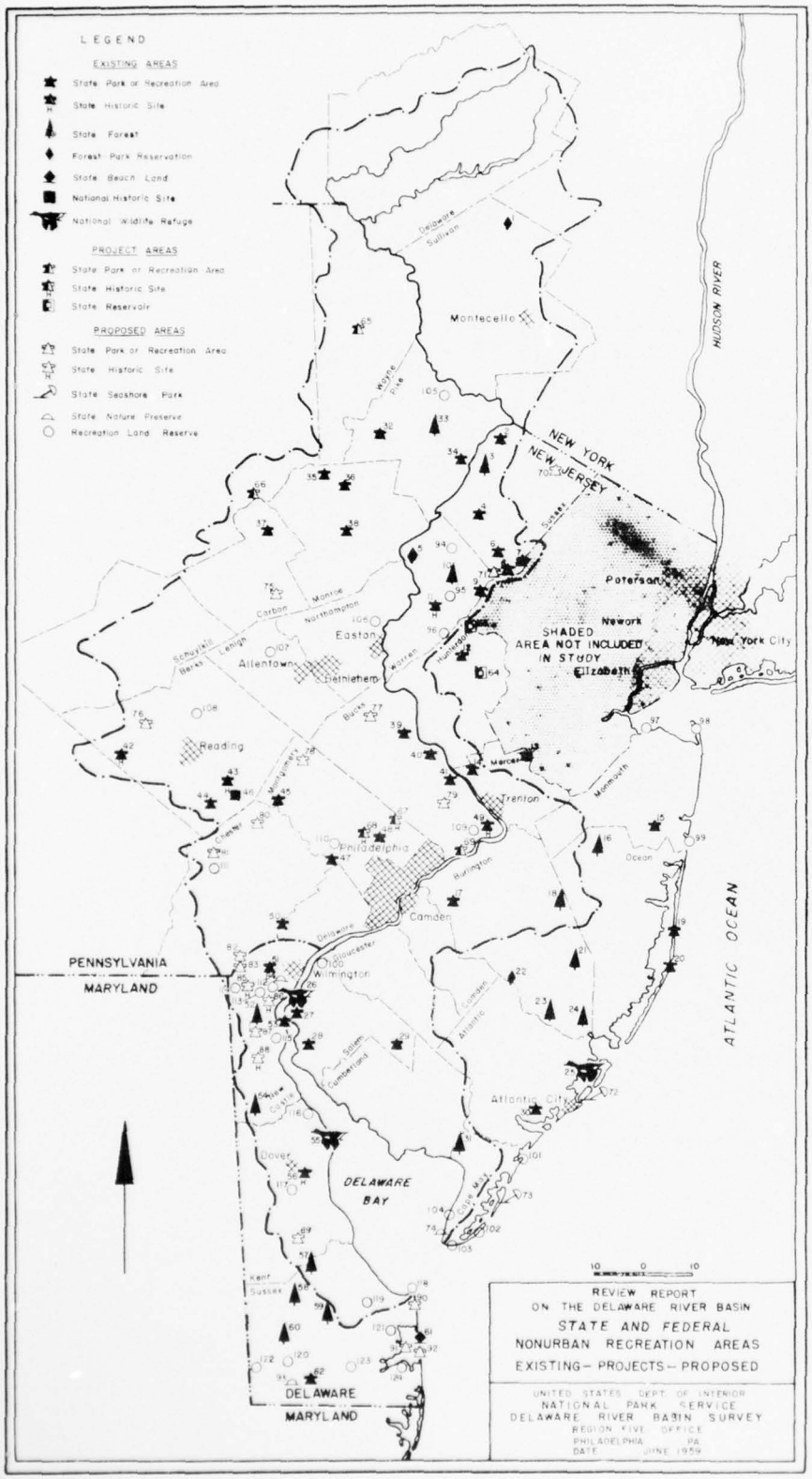
688. The Federal government has a basic responsibility in developing water resources projects to protect existing recreational resources, to preserve and make available the basic recreational resource created by the project and to enhance this recreational potential in appropriate cases. Consideration is given in this report to Federal participation in such cases where it is desirable to improve the available resource beyond a level normally undertaken by the Federal government and where such development exceeds the capability of non-Federal interests and is otherwise in the public interest.

FEDERAL WATER CONTROL PROJECTS

689. The Corps of Engineers, Department of the Army, and the Soil Conservation Service, Department of Agriculture, currently have authorized projects under construction or in the planning stage within the Basin that have or will offer recreation opportunities to the public. Under the program of the United States Army, Corps of Engineers shore protection projects have been authorized at Atlantic City, Ocean City and Cold Springs Inlet, New Jersey, and in the vicinity of Indian River Inlet to and including Rehoboth Beach, Delaware. Other shore protection projects recommended by the Secretary of the Army include those for Borough of Barnegat Light, Long Beach Island, Ventnor, Margate, Longport, Stone Harbor, and North Wildwood, all in New Jersey. The beach erosion problems at these localities have been studied and plans of improvement developed that will provide wider and higher protective and recreational beaches. The projects provide for Federal participation in the costs of measures for restoring and protecting beaches that are open to the public for recreational use.

CORPS OF ENGINEERS

690. The Corps of Army Engineers has three flood control projects



EXISTING NONURBAN RECREATION AREAS

NEW YORK

1 Catskill Forest Preserve

NEW JERSEY

2 High Point S. P.
3 Stokes S. F.
4 Swartswood S. P.
5 Worthington Tract
6 Cranberry Lake S. P. (Undev.)
7 Hopatcong S. P.
8 Musconetcong S. P.
9 Stephens S. P.
10 Jenny Jump S. F.
11 Oxford Furnace S. H. S.
12 Voorhees S. P.
13 Princeton Battlefield S. P.
14 Washington Crossing S. P.
15 Allaire S. P.
16 Jackson S. F.
17 Mount Laurel S. P. (Undev.)
18 Lebanon S. F.
19 Island Beach S. P.
20 Barnegat S. P.
21 Penn S. F.
22 Wharton Tract
23 Greenbank S. F.
24 Bass River S. F.
25 Brigantine N. W. R.
26 Killcohook N. W. R
27 Fort Mott S. P.
28 Hancock House S. H. S.
29 Parvin S. P.
30 Somers House S. H. S.
31 Belleplain S. F.

PENNSYLVANIA

32 Promised Land S. P.
33 Delaware S. F.
34 George W. Childs S. F.
35 Gouldsboro S. P.
36 Tobyhanna S. P.
37 Hickory Run S. P.
38 Big Pocono S. P.
39 Ralph Stover S. P.
40 Roosevelt S. P.
41 Washington Crossing S. P.
42 Conrad Weiser S. H. S.
43 Daniel Boone Homestead S. H. S.
44 French Creek S. P.
45 Pottsgrove S. H. S.
46 Hopewell Village N. H. S.
47 Valley Forge S. P.
48 Fort Washington S. P.
49 Pennsbury Manor S. H. S.
50 Brandywine Battlefield S. P.

DELAWARE

51 Brandywine Springs S. P.
52 Red Lion S. F.
53 Fort Delaware S. P.
54 Blackbird S. F.
55 Bombay Hook N. W. R.
56 John Dickinson Mansion S. H. S.
57 Appenzellar S. F.
58 Ellendale S. F.
59 Redden S. F.
60 Owens S. F.
61 State Beach Lands
62 Trap Pond S. F.

NONURBAN RECREATION PROJECT AREAS

NEW JERSEY

63 Round Valley Reservoir
64 Spruce Run Reservoir

PENNSYLVANIA

65 Prompton Reservoir S. P.
66 Bear Creek Reservoir S. P.
67 Greene Park S. H. S.
68 Hope Lodge S. H. S.
69 Logan Estate S. P.

PROPOSED NONURBAN RECREATION AREAS

NEW JERSEY

70 Wawayanda Lake
71 Allamuchy Mountain
72 Absecon Inlet Beach
73 Seven Mile Beach
74 Higbee Beach

PENNSYLVANIA

75 Indian Hills
76 Tulpehocken Creek
77 Haycock Mountain
78 Green Lane
79 Newtown Reservoir
80 French Creek
81 Baron Hills
82 Mason-Dixon Interstate

DELAWARE

83 Mason-Dixon Interstate
84 Churchman's Marsh
85 Coooh's Bridge
86 Buena Vista
87 Lums Pond
88 Commodore Macdonough House
89 Killen-Coursey-McCauley Ponds
90 Delaware Dunes
91 Long Neck
92 Delaware Seashore
93 Trussum Pond

RECREATION LAND RESERVES

NEW JERSEY

94 Proposed Paulins Reservoir Project
95 Proposed Pequest Reservoir Project
96 Proposed New Hampton Reservoir Project
97 Connaskonk Point
98 Sandy Hook
99 National Guard Beach
100 Raritan Arsenal
101 Corsons Inlet
102 North Hereford Inlet Beach
103 West Cape May Beach
104 Cox Hall Creek

PENNSYLVANIA

105 Shohola Falls
106 Jacobsburg Tract
107 Proposed Trexler Reservoir Project
108 Proposed Maiden Creek Reservoir Project
109 Warner Lakes
110 Proposed Evansburg Reservoir Project
111 Proposed Pa. Dept. of Forest & Waters Reservoir Project

RECREATION LAND RESERVES

DELAWARE

112 Proposed Christiana Reservoir Project
113 Smalleys Pond
114 Becks Pond and Sunset Lake
115 Augustine Beach
116 Woodland Beach
117 Voshell Pond
118 Cape Henlopen (Ft. Miles Military Reserv
119 Red Mill Pond
120 Collins Mill Pond
121 West Shore of Rehoboth Bay
122 Nanticoke River
123 Ingrams Pond
124 South Shore of Indian River Bay

S. P. - State Park
S. F. - State Forest
S. H. S. - State Historic Site
N. W. R. - National Wildlife Refuge
N. H. S. - National Historic Site

PLATE 8

under construction, namely, Prompton, Bear Creek and Dyberry Reservoirs. The latter being a "dry bed" reservoir, will not enhance the present recreation value of the site.

691. The Pennsylvania Department of Forests and Waters has definite plans for the development of the recreation resources of Prompton and Bear Creek Reservoirs. Agreements are being worked out with the Corps of Engineers for the acquisition and development of lands adjacent to Prompton Reservoir for park purposes and for the installation of basic facilities at Bear Creek Reservoir. These sites are included in the nonurban recreation plan for the Pennsylvania portion of the Basin.

SOIL CONSERVATION SERVICE

692. The Department of Agriculture, through the Soil Conservation Service, administers the Watershed Protection and Flood Prevention Act, (Public Law 566 - 83rd Congress; 68 Stat. 666), as amended, that authorizes the Secretary of Agriculture to cooperate with States and local agencies in the planning and carrying out of works of improvement for soil conservation, and for other purposes. Specifically, this Act authorizes the construction of upstream auxiliary reservoirs in watersheds or watershed areas not exceeding 250,000 acres and not including any single structure which provides more than 5,000 acre-feet of floodwater retention capacity or more than 25,000 acre-feet of total capacity. The construction of larger improvements must be approved by resolutions adopted by the appropriate committees of the Senate and the House of Representatives.

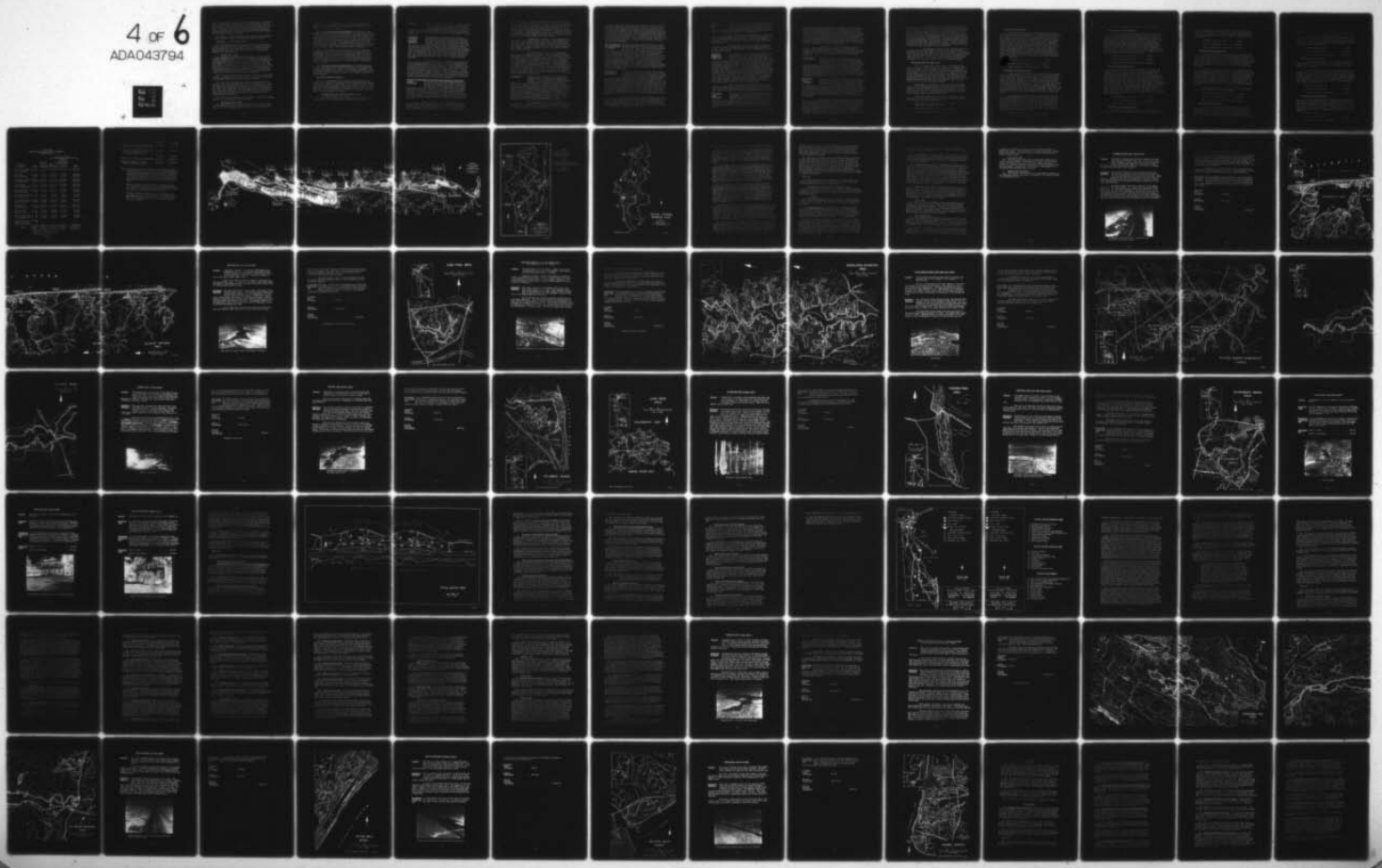
693. It is the responsibility of the local sponsoring agency to acquire, without cost to the Federal Government, all land, easements, or rights-of-way as will be needed in connection with the works of improvement to be installed and to operate and maintain structures and other improvements on privately-owned land. As a normal practice, the local sponsoring agency acquires only easement rights for the dam site and inundated area. Ownership of the land remains with the grantor of the easement, thus access to the impoundment is controlled by the land owner.

694. The Soil Conservation has indicated that it would be economically feasible to construct 85 auxiliary upstream reservoirs in the Delaware River Basin. Forty-two of these are justifiable under P. L. 566 and have been or will be programmed for construction in the future. The remaining 43 are justifiable from the standpoint of flood control alone and will be included in the proposed development plan for the Basin. For the most part, these projects when completed will create small impoundments ranging from 3 to 20 acres in surface area. A limited number will exceed 30 acres. Recognizing that any impounded water has recreation value, the potential significance of the small watershed program to nonurban recreation becomes apparent in view of the number and distribution of possible reservoirs. The average size of the day-to-day recreation water area is not large enough to warrant consideration for extensive public use as a State park or recreation

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area. However, the potential value of these impoundments if developed as local, community, or county parks would be considerable. Many of these small reservoirs could well serve as the nucleus for small parks close-at-home, one of the greatest nonurban recreation needs of the Basin. Preliminary appraisal of these projects has been achieved by supplying the referenced Work Group pertinent data and their findings will be presented in Appendix R.(54)

695. Plate 11 indicates the approximate location and distribution of the 85 auxiliary upstream reservoir sites referred to above.

IMPROVEMENT OF EXISTING FEDERAL AREAS

696. The Federally-owned nonurban recreation areas in the Basin might be described as "special purpose" areas as opposed to the multiple-use features of State-owned recreation areas. Programs for the improvement of these areas must then be in accord with the primary purpose of the individual area.

NATIONAL PARK SERVICE

697. Hopewell Village National Historic Site: As a part of the MISSION 66 program of the National Park Service, Hopewell Village is currently (1959) undergoing a comprehensive program of improvement and when completed, the needs of the area and the visitor will have been provided for in keeping with the historical significance of the site. Specifically, the program provides for the improvement of roads, trails, and parking areas, construction of a new visitor center and museum, restoration or reconstruction and rehabilitation of 23 buildings such as the Ironmaster's Mansion, casting house, village store and office, tenant houses, wheelwright shop, schoolhouse and others.

698. Visitors to this historic site will be able to grasp the fundamentals of early American iron making processes during a trip through the buildings comprising the furnace group of buildings.

699. Life in an early American village will be depicted in the store and office, the blacksmith shop, and the wheelwright shop. Each building will be furnished with authentic tools of the trade. Two of the oldest tenant houses will be furnished with exhibits of home crafts practiced in these dwellings. In these homes may be visualized the lives, comforts, and way of life of the laboring classes. In the Ironmaster's Mansion, the contrasting way of life of the wealthly and influential will be depicted.

700. The visitors enjoyment of the area will be primarily aesthetic. There will be no recreation facilities provided.

NATIONAL WILDLIFE REFUGES

701. Bombay Hook National Wildlife Refuge: In view of the insect pest problem and the marshy character of the terrain, mass public use of this area is not feasible under these conditions. Nevertheless,

several small roadside picnic sites are planned for day visitation in connection with birdwatching and fishing trips to the refuge. Eventual control of insects will in all probability result in a much greater public use of this area.

702. Brigantine National Wildlife Refuge: The marshes, sedge islands, and beaches to the east and north of the refuge are considered to be one of the most valuable marsh habitats along the Atlantic Coast. It is the wintering grounds for the Atlantic brant, ducks, geese, and contains the largest colony of laughing gulls along the east coast. In the summer, gulls, terns, skimmers, herons, egrets, and other marsh and water birds are to be found. The songbird migrations of summer and fall pass through the area. Many plants, flowers and trees are of particular interest. The beaches north and south of Little Egg Inlet are about 5 miles in length, often washed over and are unstable.

703. This area should be preserved because of its outstanding biological values. At the present, portions of the area are owned by the National Audubon Society and the Philadelphia Conservationists Incorporated. Other sections are potentially available. In view of the present holdings of U.S. Fish and Wildlife Service in this region and the character of the resources involved, consideration should be given to the expansion of Brigantine Wildlife Refuge to include this valuable habitat.

704. Killcohook National Wildlife Refuge: The terrain and cover types on the refuge are not particularly suitable for the development of visitor facilities and no specific recreational improvements or facilities are planned for this area. Fort Mott State Park (N.J.) adjoins this refuge and provides day-use facilities that would be available to refuge visitors.

RECOMMENDED FEDERAL DEVELOPMENT

705. It is recommended that the proposed Tocks Island dam and reservoir, if authorized, be developed for nonurban recreation purposes. In view of the potential significance of this proposed project to afford much needed nonurban recreation opportunities within the region it would serve, the plan of development by the Federal Government should be directed at a complete utilization of the recreation resources that would result from this proposed construction.

PROPOSED TOCKS ISLAND RESERVOIR RECREATION AREA

(See Plate 9 following page 139.)

706. The following factors have been considered in the recommendation of this site for development by the Federal Government:

LOCATION

A dam in the Delaware River at a point approximately 6 miles upstream from the Delaware Water Gap will form proposed Tocks Island Reservoir. The reservoir at full pool will extend to Port Jervis, New York, a distance of approximately 33 miles. The main body of the reservoir at normal pool will be situated between the States of Pennsylvania and New Jersey.

FEATURES OF RESERVOIR & EFFECTS ON RECREATION

The proposed Tocks Island Reservoir would have a surface area of 11,100 acres at elevation 405 feet and 14,600 surface acres at flood pool, elevation 423 feet. The reservoir at the 405 feet level (the recreation water area) would extend 30 miles up the Delaware River and 8 miles up Flatbrook Creek. The average width of the main body of the reservoir would be approximately 1/2 mile and about 1-1/2 miles at the widest point. The Flatbrook arm would have an average width of less than 1/4 mile. The normal depth at the dam would be 105 feet. At elevation 405 feet there would be approximately 100 miles of shoreline. The general outline of the reservoir would be pleasing in that numerous bays and necks would exist and the shoreline would be irregular.

The recreation values of the Tocks Island Reservoir would be exceptionally high. The water quality of the Delaware River and its tributaries above the dam site is good and the impoundment would be suitable for all forms of water recreation. A water body of 11,100 surface acres located in the scenic surroundings prevailing at the site would have tremendous drawing power for recreation purposes. Assuming that the water level would be constant or nearly so during the recreation season from April to October, and adequate land publicly acquired, the proposed Tocks Island Reservoir could become one of the most significant nonurban recreation areas in the Eastern United States.

GENERAL CHARACTERISTICS OF THE PROJECT AREA PERTINENT TO RECREATION USE AND DEVELOPMENT

The terrain surrounding the proposed reservoir is interesting and varied. In general, the land on the west shore (Pennsylvania) rises steeply from the water line to a rolling plateau at an average elevation of 1,200 feet. Small tributary streams along the Delaware River within the reservoir area have eroded deep gorges and formed picturesque waterfalls in their descent from the plateau to the river. Excellent sites are available for the development of a wide variety of recreation activities. The scenic qualities along this shore are particularly good and add materially to the recreation values of the project area.

Lands adjacent to the proposed reservoir on the east side (New Jersey) slope from the crest of Kittatinny Mountain to the water line. The northern portion of these lands are interspersed with stream valleys and agricultural lands. The eastern edge of Kittatinny Mountain falls away sharply and forms a scenic escarpment

that is particularly pronounced in the vicinity of Delaware Water Gap and extends several miles to the northeast. A rather unusual feature of this landscape is the location of a number of lakes at or near the crest of the mountain. The over-all topographic features of this eastern side lend themselves to a variety of recreation uses. Numerous shoreline sites are particularly adaptable to intensive recreation activities and a countless number of sites for activities not requiring water frontage such as camping, picnicking, group camping, etc., can be found at higher elevations back from the shoreline.

Approximately 75 percent of the land proposed for inclusion in this recreation area is forested. Mixed hardwoods predominate; however, representative stands of hemlock and white birch are to be found. The age of this cover varies from mature forests in the steep rocky gorges to young growth taking over abandoned agricultural fields. The forests of this area can be described as second growth mixed hardwoods.

The scenic quality of the area surrounding the project site is excellent. The Delaware Water Gap where the Delaware River pierces the Kittatinny Mountain is 6 miles downstream from the proposed dam site. It is generally recognized as one of the outstanding natural features of the Delaware River Basin. The Kittatinny Mountain escarpment is a significant geological feature and provides excellent panoramic sightseeing opportunities. Numerous waterfalls are found in the steeply eroded hemlock gorges. Small lakes and ponds are found scattered throughout the area. Good forest cover extends to the horizon on either side of the project site and adds to the scenic beauty. The introduction of a large body of water, in this attractive setting would greatly enhance its recreation potential. It would, in itself, constitute a scenic feature.

ACCESSIBILITY

Existing highway provide access to the proposed reservoir site. U.S. Route 209 traverses the reservoir area from the village of Bushkill, Pennsylvania, a short distance above the dam site to Port Jervis, New York, and will be inundated through much of this length. In planning a relocation route and construction standards for this highway, consideration should be given to the fact that this route would be a principal access from Stroudsburg, Pennsylvania, and Port Jervis, New York, where it intersects with east-west highways. U.S. Route 611 extends directly from the Philadelphia Metropolitan Area. U.S. Routes 46, 206, and State Routes 15, 23, and 94 provide access to the site from the New Jersey-New York Metropolitan Area. Many sections of these highways are presently undergoing widening and other improvements to carry an ever increasing volume of traffic.

The greatest need for mass access routes will be in Northern New Jersey. The existing highways referred to above would be inadequate to serve the demand generated from the New Jersey-New York Metropolitan Area if the reservoir were constructed and recreation

development undertaken. Planned highway improvement, particularly the interstate highway system, will greatly improve the access situation. Interstate Highway Route 80 will provide direct access from the New York City area to Stroudsburg, Pennsylvania, and a planned freeway will extend to Port Jervis, New York. The proposed widening and dualization of U.S. Route 206 and State Route 15 will materially improve routes of access from the New York-New Jersey Metropolitan region. While these routes will provide approaches to the general region of the project area, need for direct access roads to connect with these arterial highways will have to be provided.

TYPE OF RECREATION FOR WHICH THE AREA IS SUITABLE — The proposed project will be suitable for a wide variety of nonurban recreation activities providing sufficient land is acquired and made available for public use. The 11,100 acres of recreation water will certainly attract tremendous boating activity, and associated with boating will be fishing, water skiing and related water sports. Picnicking, camping, and swimming will unquestionably be popular activities also. The scenic qualities of the area will attract numerous visitors, and the development of scenic drives, parking overlooks, and interpretive trails will provide a broader base for this important aspect of recreation use. A demand for organized group camping should be anticipated and provided for in the plan of development. On lands not suited to mass public use, rental vacation cottages could be developed. This type of use has proven to be quite popular within the general region.

REGION SERVED AND POPULATION — It would be difficult to determine with any degree of accuracy the limits of the region which the proposed reservoir would serve. No comparable publicly-owned water-based recreation area exists anywhere in the northeastern United States. The region to be benefitted most directly will be the metropolitan region of northeastern New Jersey, the Greater New York City area, and the Philadelphia Metropolitan area. The number of potential day-uses will increase as travel time decreases with the introduction of new and improved highways and utilization continues to expand in the general direction of the proposed area. The radius of influence for weekend and vacation visitors would extend far beyond the surrounding metropolitan centers. It is expected that it would draw heavily from points up to 200 miles and to a lesser degree from distances beyond.

It is estimated that 20 million people reside within 75 miles of the project site. Within 100 miles, the contributing population is approximately 30 million. These figures represent approximately 11 and 15 percent, respectively, of the total population of the United States. By 1980, the population within 75 miles is estimated to be 27 million and 37 million by the year 2010.

RELATED RECREATION AREAS

Significant publicly-owned nonurban recreation areas located within 75 miles of the project site includes Palisades Interstate Park and half of Catskill Park in New York State, High Point State Park and Stokes State Forest in New Jersey, and Hickory Run, Promised Land, Tobyhanna State Parks and Delaware State Forest in Pennsylvania.

This 75-mile radius includes the very important private resort developments in the foothills of the Catskill Mountain of Sullivan County, New York and the Pocono Mountains of Pennsylvania plus thousands of privately-owned summer cottages in New York, New Jersey, and Pennsylvania.

The development of the project area would have an advantageous effect on existing recreation areas within the general region in that congestion and over-use of some areas would be at least temporarily relieved.

ESTIMATE OF RECREATION NEEDS & USE

The nonurban recreation areas now available to the public within 75 miles of the project site are heavily used and facilities are grossly inadequate to meet the visitor demands placed upon them. Many of these areas have already reached their maximum use capacity and others will very soon reach this stage. Over-use has resulted in deterioration and damage to resources in many areas. There are few, if any, regions in the United States that have greater need of additional recreation land and water space than the area that would be served by this proposed project. There are few, if any, regions in the United States that have a greater need for nonurban recreation water and land space and recreation facilities. Overcrowding and inadequate facilities have been the most often voiced complaints concerning nonurban recreation opportunities in the Basin and are the principal deterrents to more extensive recreation enjoyment. Boating, fishing, and camping opportunities are particularly lacking. Day-use facilities throughout the Basin are inadequate to meet the visitor loads to existing areas.

It is conservatively estimated that there would be 3,500,000 man-day visits to the project area annually. This estimate takes into account increases in facilities as proposed in the various State sections of the over-all nonurban recreation plan for the Basin.

RECOMMENDED LAND ACQUISITION

The proposed Tocks Island Reservoir will create an outstanding recreation resource and will greatly enhance the value of lands surrounding the project site for recreation. If the recreation values of the project are to be made available to the public, it will be necessary to acquire extensive land areas to adequately accommodate the expected visitor load, to provide adequate space for necessary and desirable facilities, and to maintain an appropriate nonurban environment.

The lands required for these purposes are privately

owned with the exception of 6,488 acres contained in the Worthington Tract (forest-park reservation), and game lands now owned by the State of New Jersey, and 281 acres in George W. Childs State Park in Pennsylvania. Approximately 48,000 acres of land above the flood elevation of 423 feet are considered to be necessary for the placement of necessary facilities, the accommodation of visitors and to adequately protect the scenic features and to maintain control of the resources. This area would provide essential buffer zones, contain scenic features significant to the project area, and guarantee public use of all resources created or enhanced as a result of the project.

Based on the estimate of 5,000,000 visitors per year and a $1.60 recreation value per visitor day there would be produced a gross annual monetary recreation benefit of $8,000,000. The present annual recreation value of this reservoir site is estimated to be $800,000. This gives a net annual gain in recreation value of $7,200,000.

ADMINISTRATION — The magnitude and potential significance of the proposed project for nonurban recreation; the enhancement of adjoining land values for recreation; the broad regional significance of the project; the large population to be served; the interstate character of the project area; the great need for a nonurban recreation area of this potential size; and the fact that such an undertaking would exceed the normal capabilities of the States most directly concerned, are among the factors which point to the need of Federal administration of this area in order to assure the fullest public benefit from the resources to be created or enhanced by the construction of the project.

RECOMMENDED PLAN OF DEVELOPMENT — The plan of development including the selection of sites for recreational use is based on the following assumptions: (1) The plan of operation as it pertains to water elevations will not adversely affect the recreation values of the reservoir area; (2) The project area will be administered as a management unit; (3) Public use will take precedence over all other activities within the recreation boundary; (4) All existing highways and roads within the recreation boundary, except U.S. Highway 206, will be vacated and those roads within the boundary will be used for interior circulation, administration and protection or will be obliterated.

The plan as outlined below has been directed toward full use of the available resource and constitutes in summary form the ultimate development outline for the project. The plan is not intended to be fixed but rather it should be considered tentative, flexible, and subject to revision and modification on the basis of further detailed studies. Investigations and studies conducted in the Delaware River Basin have indicated that full development of the project would be required soon after completion of the project and the impoundment of water in order to accommodate the estimated visitor load.

A plan for the provision of minimum basic facilities is not included as a reduction in size of the land area and the facilities that could thus be introduced would be inadequate to provide either space or facilities needed to accommodate the estimated visitor load. A minimum desirable boundary has not been indicated on Plate 9 ; however, an area of 21,000 acres surrounding the reservoir site has been considered in this category. The developments that would be provided within this reduced boundary should follow the same general pattern as outlined for the full development. The quantity of facilities would necessarily be reduced but the quality would remain unchanged. Table 12, page 138 indicates pertinent data relative to the provision of minimum facilities along with the data for optimum or full development.

The selection of sites or areas for the various uses is based on the recreation needs of the region, the extent to which those needs could be fulfilled by the available resources of the proposed recreation area and other factors including accessibility, terrain, shoreline, size and extent of usable land, scenic quality and relationship to other areas and uses. Ten sites or use areas have been selected for development, they are shown on Plate 9, and are described below.

"A" Delaware Water Gap Scenic Area

This area extends from approximately 1 mile above the dam site to a point 7 miles downstream. It includes an outstanding portion of the Kittatinny Mountain, the Delaware Water Gap, (a noted physiographic feature), and six miles of the Delaware River including several river islands. The scenic quality and geological features of this portion of the project area are prime factors that add materially to the general attractiveness of the entire project. This area should be included for the primary objective of preserving these features in their present seminatural conditions insofar as practical and to be made available to the visitor for scenic enjoyment.

Development in the interior of this tract should be simple and in keeping with the general setting for those seeking outdoor enjoyment in near-wilderness conditions. Foot and bridle trails with trailside campsites would be provided and scenic overlooks at vantage points would be included. The Appalachian Trail follows the crest of the Kittatinny Mountain and traverses this area.

Approximately 7,000 acres are included within this area, of which 6,200 are now owned by the State of New Jersey and contained in the Worthington Tract Forest-Park Reservation.

Estimated annual visitation. 350,000
(Including sightseers at the dam)

Estimated development costs. $956,000

Plans, supervision and contingencies . $239,000

"B" Poxono Recreation Area

The Poxono Recreation Area is located on the west shore of the proposed impoundment in Pennsylvania. It extends from the dam site up to and including Bushkill Creek, a shoreline distance of 9 miles. It is considered the principal or major recreation site on the west or Pennsylvania side of the proposed reservoir area. The 3,000 acres included in this site offer a varied topography, numerous outstanding natural features including lakes, an elongated plateau, ravines and waterfalls and a varied and interesting shoreline. This area with its group of features, in combination with its size, lends itself to intensive use and development for a variety of recreation activities. There are excellent sites for beach development and a sizeable cove at Bushkill which would make excellent sites for marina developments. There is also ample space with suitable terrain for picnic and campground developments. The size and character of the general area would permit intensive use.

Estimated annual visitation. 800,000

Estimated development costs. $2,800,000

Plans, supervision and contingencies . $ 700,000

"C" Wallpack Bend Recreation Area

The Wallpack Bend Recreation Area is considered the principal or major recreation area along the east shore of the proposed impoundment in New Jersey. It extends approximately 11 miles upstream from a point 2 miles above the dam site. It includes most of the east shoreline of the main impoundment up to Flatbrook and the greater portion of the east shore of the Flatbrook arm. This site contains 14,000 acres. It features a varied and interesting topography. The shorelands at the foot of Kittatinny Mountain are ideally suited for beach development and picnicking. The slopes of the Mountain immediately behind the shorelands offer excellent sites for campground development. There are also excellent locations on the mountain slopes for cottage or cabin lease sites.

At the junction of the Flatbrook arm with the main body of the proposed reservoir and along the east shore of the arm, there are coves and protected bays where boat launching and mooring facilities and marina developments could be undertaken. The lands immediately to the east of Flatbrook lend themselves to picnic and campground development. The size and general character of the Wallpack Bend area would permit its development and use in connection with the various activities referred to above for an unusually large number of visitors without adversely affecting the resource.

Estimated annual visitation. 1,500,000

Estimated development costs. 5,800,000

Plans, supervision and contingencies . . $1,472,500

"D" Flatbrook Group Camping Area

The Flatbrook Group Camping Area embraces the greater portion of the peninsula formed by the Flatbrook arm and the main body of the proposed reservoir. Within this area, there are a number of sites of sufficient size with suitable terrain that are adaptable to organized group camping and could be developed for this purpose. Existing features including wooded ridges and valleys form natural barriers between the sites. The shoreline of this peninsula offers sites for small beach developments and boat launching and mooring facilities for the camps. The isolated factor adds considerably to the desirability of this peninsula for use for group camping purposes. The area contains approximately 3,000 acres and it is adequate in size to permit subdividing into 20 group camp sites.

Estimated annual visitation. 300,000

Estimated development costs. $4,065,000

Plans, supervision and contingencies . $1,016,250

"E" Egypt Mills Recreation Area

The Egypt Mills Recreation Area contains 3,000 acres and extends about 4-1/2 miles along the west shore of the proposed impoundment to a point a short distance above Wallpack Bend. This proposed area has an interesting but rather broken topography. Except where the lateral streams enter the reservoir the shoreland rises steeply from the proposed water level. Toms Creek, the largest of the lateral streams, has cut a rather deep gorge through the escarpment and the wooded slopes, rock outcrops, and waterfalls form an attractive and inviting setting. At the mouth of the lateral streams, particularly at Toms Creek, there are small and relatively level areas where shoreline facilities could be installed including small beach areas, picnic sites and facilities for boating activities. The upland area is ideally suited for tent camping. There are also sites for 10 organized group camps in this area, in the general vicinity of the 8 lakes located in the highland area.

Estimated annual visitation. 250,000

Estimated development costs. $2,430,000

Plans, supervision and contingencies . $ 607,500

"F" Hornbeck Gorge Recreation Area

Hornbeck Gorge, a comparatively small use area containing approximately 750 acres, includes a scenically attractive hemlock gorge

of the same name and an excellent stretch of usable shoreline which lends itself to development for day-use activities including boating, bathing, picnicking, hiking, and scenic enjoyment. A wooded plateau along the northern bank overlooking the gorge is ideally suited for tent camping.

Estimated annual visitation.	50,000
Estimated development costs.	$270,000
Plans, supervision and contingencies .	$ 67,500

"G" Dingman Gorge Recreation Area

The Dingman Gorge Recreation Area features a scenic hemlock gorge along Dingman Creek. The terrain surrounding the gorge is rolling to hilly except along the shoreline of the proposed reservoir. The land included in the proposed use area has a frontage of about 3 miles along the west shore of the proposed reservoir and extends inland along Dingman Creek approximately 3 miles. It includes the George Childs State Park, an area of the Pennsylvania State Park System containing 281 acres.

The shorelands adjacent to the proposed impoundment can be classed as level to gently rolling and this general condition is found for some distance back from the shoreline. The size of this relatively level area affords excellent opportunities for facility development in connection with day outings including picnicking, swimming, boating, fishing and related uses. The wooded gorge is covered, for the most part, by a mature stand of native hemlock. Scenic hiking trails including overlooks can be provided along the entire length of the gorge to permit circulation of the visitor through this attractive natural feature.

Approximately 3,200 acres are included in this proposed use area which is planned primarily for day outings

Estimated annual visitation.	600,000
Estimated development costs.	$1,160,000
Plans, supervision and contingencies .	$ 290,000

"H" Hamanock Recreation Area

The Hamanock Recreation Area containing 5,000 acres is located along the east shore near the upper limits of the proposed impoundment. This proposed use area consists, for the most part, of a relatively level tract along 6 miles of the proposed impoundment and extends back from the shoreline a distance of approximately 1/2 mile. The topography beyond this point rises gently for a considerable

distance from where it rises steeply to the Kittatinny Mountain ridge.

The area is particularly adapted to intensive use and development in connection with day, weekend, and vacation activities. The six miles of shoreline affords ample opportunity for beach and marina developments. There is also adequate space for extensive picnicking areas close to the shoreline and tent and trailer campground developments on the wooded slopes to the east.

Estimated annual visitation 1,250,000

Estimated development costs. $4,415,000

Plans, supervision and contingencies . . $1,103,750

"I" The Knob Recreation Area

This proposed recreation area of 650 acres is located on the west side of the proposed reservoir near the upper limits and immediately below the Town of Milford. U. S. Highway crosses the Delaware River at Milford

The terrain at this site is gently sloping from the foot of a steep ridge to the proposed water line. The knob is a distictive landmark on the north end and The Cliff accurately describes the face along the south end. This use area would have approximately 7 miles of water frontage and excellent sites for beaches, boat launching and marina facilities. The over-all site is well suited for day outing and facilities for picnics, boating, fishing, swimming and related water sports should be provided.

Estimated annual visitation 150,000

Estimated development costs . . . . . $ 462,000

Plans, supervision and contingencies . . . $ 115,500

"J" Tom Quick Boat Launching Area

This boat launching site would provide access to the upper extremities of the proposed reservoir and could be reached directly from the U. S. Highway 206 an east-west route leading from the New York-New Jersey Metropolitan Area. Approximately 400 acres of essentially level land is included in this site. It contains an adequate site for the development of marina and boating facilities. Associated with boating activities would be a swimming beach, picnic areas and fishing facilities.

Estimated annual visitation 150,000

Estimated development costs . . . . . $ 442,000

Plans, supervision and contingencies . . $ 110,500

SUMMARY DATA
PROPOSED TOCKS ISLAND RESERVOIR RECREATION
DEVELOPMENT PLAN

Recreation Use Area		Acres	Estimated Annual Visitation	Estimate of Costs: *Physical Facilities	Plans Supervision Contingencies 25% of Total Cost	Total
"A" Delaware Water Gap Scenic Area	O	7,000	350,000	$ 956,000	$ 239,000	$ 1,195,000
	M	-	-	-	-	-
"B" Poxono Recreation Area	O	3,000	800,000	2,800,000	700,000	3,500,000
	M	3,000	550,000	1,822,000	455,500	2,277,500
"C" Wallpack Bend Recreation Area	O	14,000	1,500,000	5,890,000	1,472,500	7,362,500
	M	7,400	1,200,000	4,170,000	1,042,500	5,212,500
"D" Flatbrook Group Camping Area	O	3,000	300,000	4,065,000	1,016,250	5,081,250
	M	3,000	150,000	2,000,000	500,000	2,500,000
"E" Egypt Mills Recreation Area	O	3,000	250,000	2,430,000	607,500	3,037,500
	M	1,800	60,000	205,000	51,250	256,250
"F" Hornbeck Gorge Recreation Area	O	750	50,000	270,000	67,500	337,500
	M	750	30,000	152,000	38,000	190,000
"G" Dingman Gorge Recreation Area	O	3,200	600,000	1,160,000	290,000	1,450,000
	M	2,000	400,000	793,000	198,250	991,250
"H" Namanock Recreation Area	O	5,000	1,250,000	4,415,000	1,103,750	5,518,750
	M	2,000	1,000,000	3,532,000	883,000	4,415,000
"I" The Knob Recreation Area	O	650	150,000	462,000	115,500	577,500
	M	350	100,000	326,000	81,500	407,000
"J" Tom Quick Boat Boat Launching Area	O	250	150,000	442,000	110,500	552,500
	M	200	110,000	327,000	81,750	408,750
Buffer Areas, Protective Zones and Deferred Use Areas	O	8,150	-	-	-	-
	M	500	-	-	-	-
TOTAL	O	48,000	5,400,000	$22,890,000	$5,722,500	$28,612,500
	M	21,000	3,600,000	$13,327,000	$3,331,750	$16,658,750

* Does not include land costs
O Optimum or full development
M Minimum development

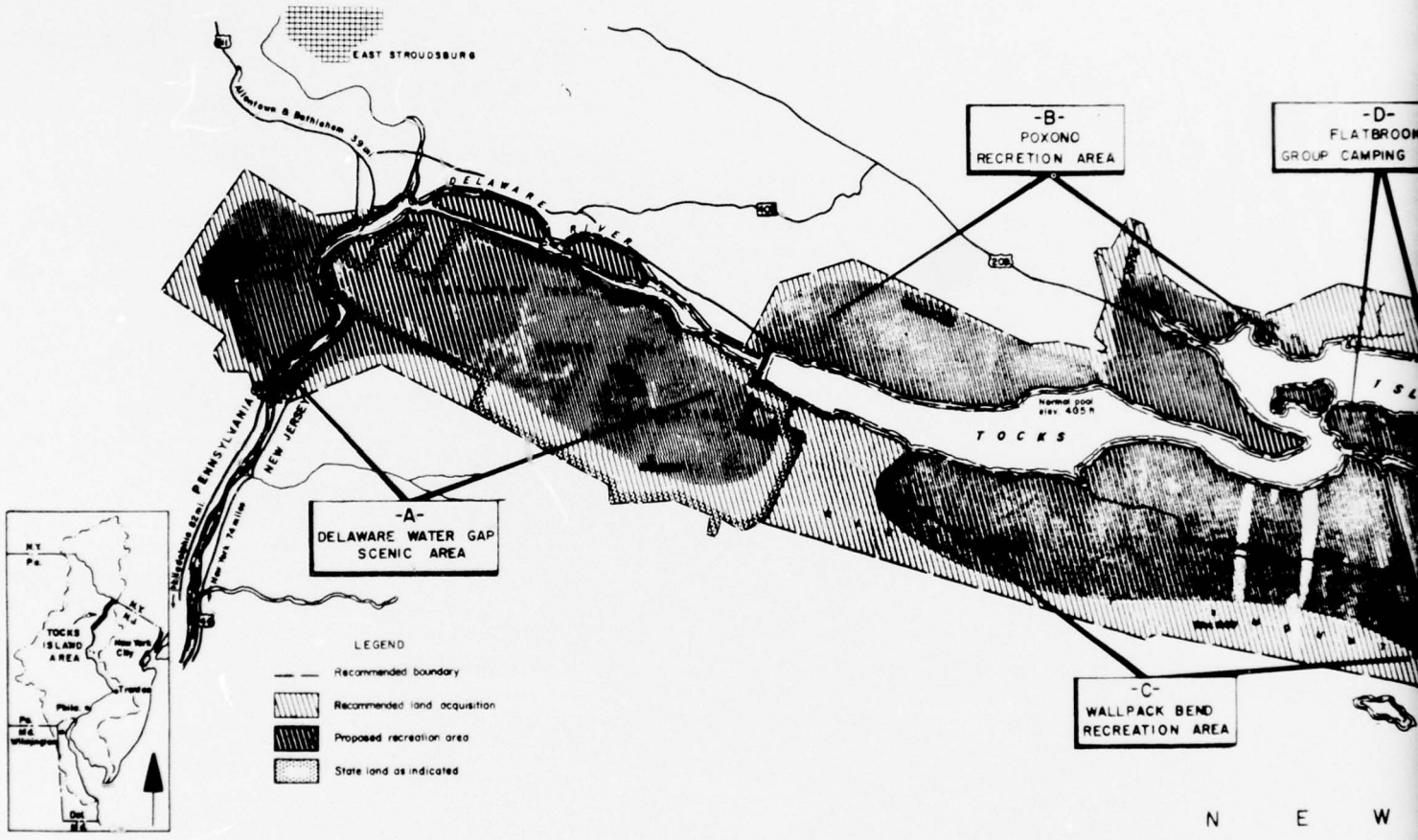
TABLE 12

	Optimum	Minimum
Annual equivalent of development costs (Amortized at 2½ for 50 years .035)	$1,001,438	$ 583,056
Annual operation and maintenance costs (3% of development costs plus $0.10 per visitor day)	$1,398,375	$ 859,763
Annual cost of recreation development	$2,399,813	$1,442,819
Recreation monetary equivalent (Annual visitation x $1.60)	$8,640,000	$5,760,000

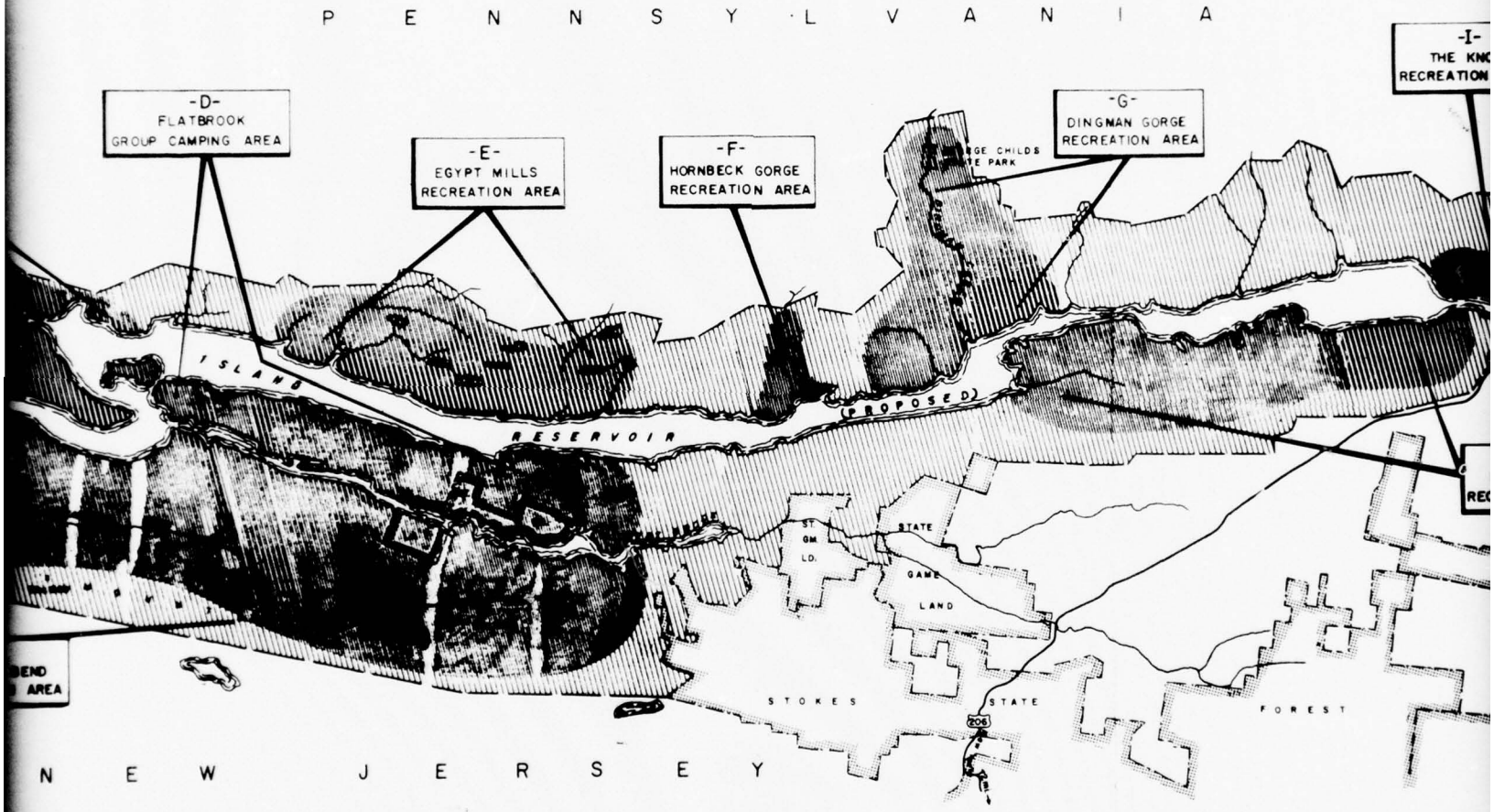
Note: The estimate of costs for recreation development provides for necessary access roads, parking areas, picnic ground development, campground development, utilities (water, sanitation, power), beach development, boating facilities, conservation and landscape treatment, walks, trails, signs, entrance control stations, administration and operation areas as may be required including necessary structures in each of the use areas.

Details pertaining to the recreation development for the Tocks Island area are being supplied the planning agency and will appear in the appropriate appendix dealing specifically with the Tocks Island multiple-purpose project

Recreation planning data for other major reservoirs to be proposed in the plan of improvement for the Delaware River Basin are also being supplied the planning agency and these data will be contained in appropriate appendices dealing with these projects.



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P E N N S Y L V A N I A
-D-
FLATBROOK
GROUP CAMPING AREA
-E-
EGYPT MILLS
RECREATION AREA
-F-
HORNBECK GORGE
RECREATION AREA
-G-
DINGMAN GORGE
RECREATION AREA
-I-
THE KNO
RECREATION
ISLAND
RESERVOIR
(PROPOSED)
STATE
GAME
LAND
STOKES
STATE
FOREST
206
N E W J E R S E Y

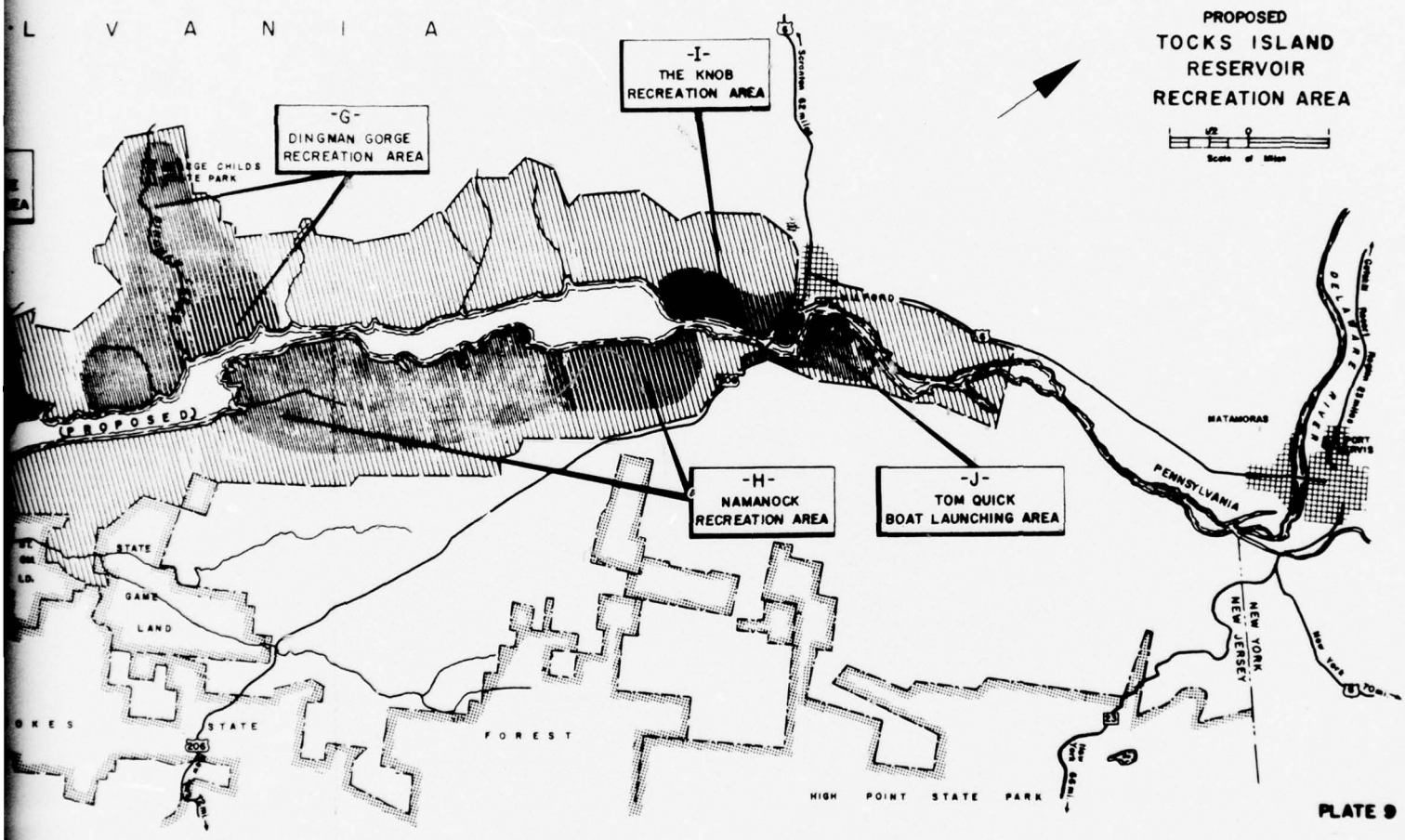
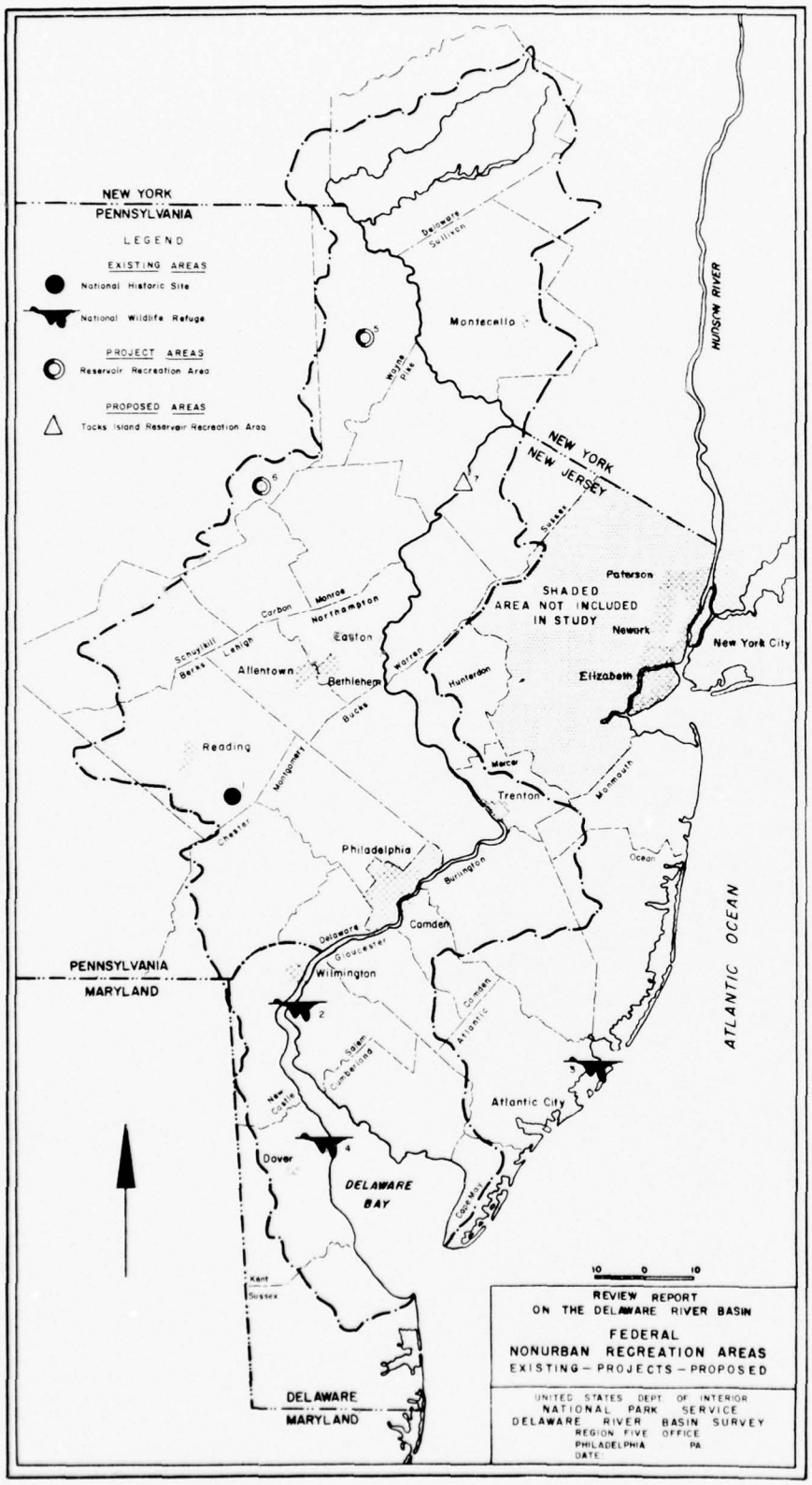

PROPOSED
TOCKS ISLAND
RESERVOIR
RECREATION AREA
-I-
THE KNOB
RECREATION AREA
-G-
DINGMAN GORGE
RECREATION AREA
-H-
NAMANOCK
RECREATION AREA
-J-
TOM QUICK
BOAT LAUNCHING AREA
(PROPOSED)
MATAMORAS
PENNSYLVANIA
NEW YORK
NEW JERSEY
STATE
GAME
LAND
STATE
FOREST
HIGH POINT STATE PARK

PLATE 9



EXISTING AREAS

1 Hopewell Village National Historic Site

2 Killcohook National Wildlife Refuge

3 Brigantine National Wildlife Refuge

4 Bombay Hook National Wildlife Refuge

PROJECT AREAS

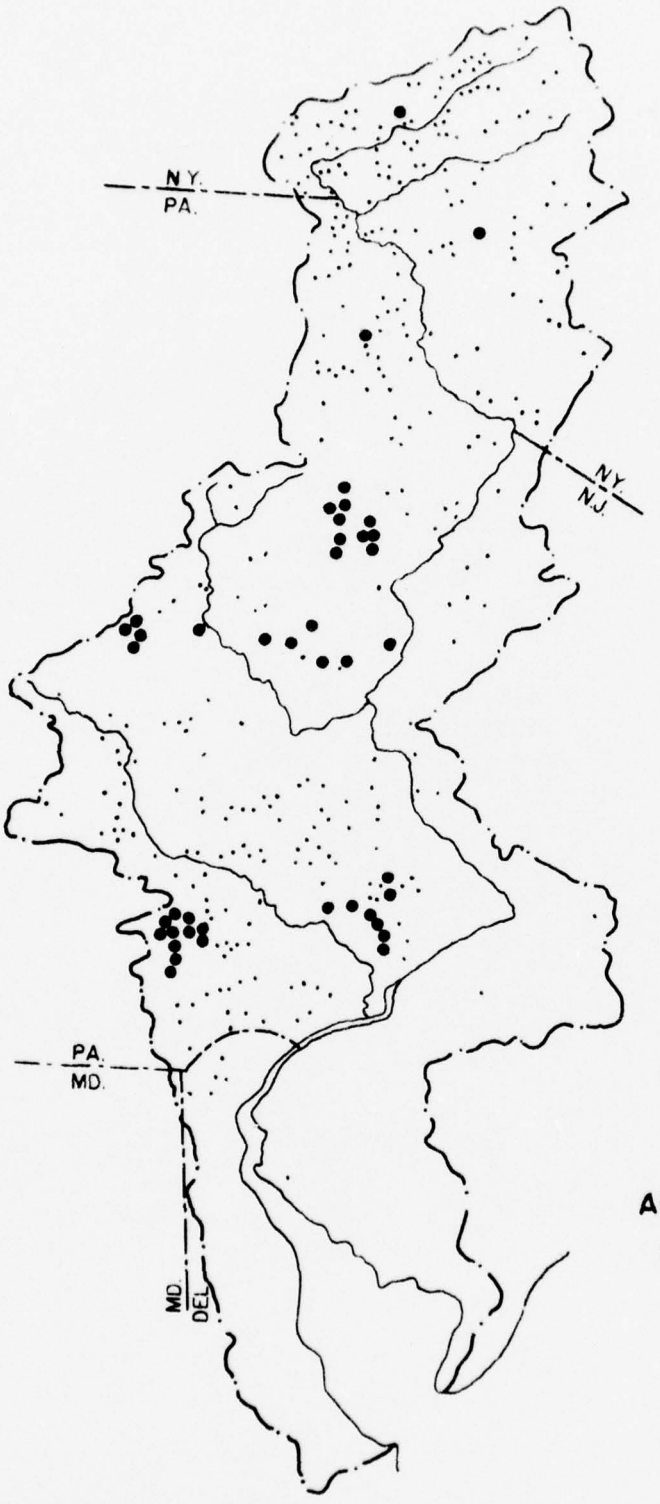
5 Prompton Reservoir (Recreation Development by State of Pa.)

6 Bear Creek Reservoir (Recreation Development by State of Pa.)

PROPOSED AREAS

7 Tocks Island Reservoir Recreation Area

PLATE 10



AUXILARY UPSTREAM RESERVOIR SITES

LEGEND

- Potential sites
- Recommended sites

SOURCE: S.C.S., U.S.D.A.

PLATE II

NONURBAN RECREATION PLAN - DELAWARE (See Plate 22 following page 168.)

707. The studies and investigations conducted throughout the State of Delaware constitute the basis upon which this plan has been developed. The non-Basin portion of the State was included within the study area. These studies have indicated a striking deficit in nonurban recreation opportunities, particularly in Northern New Castle County and generally throughout the State. This does not imply a shortage of recreation resources as much as a lack of publicly-owned recreation space and facities.

708. The concentration of one-third of the State's population on less than 10 percent of the area in the extreme northern portion of New Castle County adjacent to the densely populated southeastern corner of Pennsylvania doubly complicates the problem of dispersing that population to available or potential recreation sites. The task then becomes one of providing recreation opportunities as close to this population center as possible. This could be accomplished in two ways: First, through a system of metropolitan or regional parks for the Wilmington-New Castle County area; and secondly, through the acquisition and development of large tracts as State parks or recreation areas.

709. The New Castle County Park Commission currently maintains several small parks throughout the county, some of which are situated in residential subdivisions. These areas supplement, to some extent, those installations administered by the Wilmington Park Commission. In order to have a well-rounded county-metropolitan park system, it is recommended that a metropolitan or regional park agency be established to include the City of Wilmington, Newark, and incorporated towns and rural areas of New Castle County. It would be the function of this organization to acquire, develop and operate this system of parks and recreation areas in order to provide recreation opportunities of less than a full day's outing.

710. The need for additional State parks and recreation areas is evidenced by the impact of visitors placed upon the present limited space and facilities in Brandywine Springs and Trap Pond State Parks. In order to provide ample nonurban recreation opportunities for the State's citizens and guests it will be necessary to undertake a bold and long range program of park acquisition and development of large areas capable of providing a variety of activities and absorbing large visitor loads without the loss of park values. The greatest need for this type of development is in New Castle County, and sites are available to fill this need.

711. The remainder of the State is predominately rural and where a certain freedom remains in the choice of where to fish, hunt, swim, picnic or hike through the woods. Trap Pond State Park in the extreme south central section of the State fills, in part, the need for nonurban recreation space and facilities; however, a void exists in the intensively farmed central section. These conditions are provided for in this plan.

712. The most outstanding recreation resource of the State is the

seashore and coastal area. This region affords ample opportunity for the development of intensive day-use seashore recreation areas and a State park for the preservation of a large section of natural beach. The coastal bays, largely untouched for public recreation, possess outstanding potential, if timely action is taken to acquire key locations for deferred development.

713. The State of Delaware possesses adequate nonurban recreation resources to fulfill the requirements of its citizens in relation to present needs and needs that will result from an ever increasing population. However, these resources are being rapidly appropriated for private uses to the exclusion of the general public. In order to safeguard the public's right to the use and enjoyment of the State's nonurban recreation resources, it is imperative that a comprehensive program of public acquisition and development be undertaken with a view to fulfilling present needs and providing recreation resources in reserve for deferred development.

PHASE ONE

714. This phase includes the improvement of existing areas, the acquisition and development of new sites, and the acquisition of recreation land reserves for deferred development.

IMPROVEMENT OF EXISTING NONURBAN RECREATION AREAS

715. The present State-owned lands are generally underdeveloped in proportion to their ability to meet nonurban recreation needs. Additional developments could be made in existing areas to more fully realize their recreation potential.

STATE PARKS

716. The three nonurban State parks in Delaware are undergoing a general improvement and facility development program. With the completion of this program, these park units will better serve the needs of the public.

717. Brandywine Springs: The development of Brandywine Springs into a significant unit of the State park system is hampered by its limited size (59 acres) and the virtual impossibility of expanding the area. The greatest ultimate use of this unit might possibly be that of a metropolitan park. Under any conditions, intensive development for day-use activities will produce the maximum return from this park.

718. The State Park Commission is proceeding with a plan of development along present day-use patterns. Present picnic facilities are being expanded and a new section of the park is being opened. Other considerations might include a swimming facility, interpretive trails with markers, signs, etc., the restoration of Brandywine (Chalybeate) Spring with shelter, and a continuation of appropriate landscape treatment and selective planting to maintain a desirable park environment. Every effort should be made to acquire approximately 10 acres of land adjoining the park on the east side.

719. Overuse may quite possibly become a serious problem in Brandywine Springs and controlled use to safeguard park values may be necessary in the near future.

720. Fort Delaware: The primary value of Fort Delaware as a unit of the State park system is concerned with its historical significance. However, its potential value in fulfilling nonurban recreation needs is diminished by its relative inaccessibility, low, marshy terrain and a serious insect problem.

721. Future development should be concerned with making the area readily available to visitors and the provision of necessary facilities for their use in connection with historical sightseeing. A complete restoration of the site would be desirable but economically impractical. The most urgent need is the stabilization of structures to arrest deterioration now in progress. This would include weatherproofing and restoration of those parts of buildings necessary for the safety of visitors and adequate interpretation of the site. Adequate sanitary facilities are essential. Other improvements should include such items as adequate boat service from the mainland, interpretive services and self-guiding tours, and picnic facilities. The restoration of the moat would add much to the aesthetic value of the site.

722. Trap Pond: From a nonurban recreation point of view, Trap Pond is the most significant unit in the State park system in that adequate resources and area (900 acres) are available to meet nonurban recreation needs. The Region Five Office of the National Park Service has assisted the State in the preparation of a preliminary master plan for the relocation of activity areas and the development of the park is progressing in accordance with this plan.

STATE FOREST

723. The State forests of Delaware now provide recreation opportunities such as hunting, hiking, nature study and related purposes in addition to roadside picnicking. In view of the general absence of recreation water within the State forest areas, the intensive use types of recreation do not appear urgent. The State-owned forest lands should, however, be considered in the category of recreation reserves and potentially available for this type of use.

STATE WILDLIFE AREAS

724. The wildlife areas of Delaware are managed primarily as public hunting and fishing areas; however, the administering agency recognizes that other nonurban recreation values are present and is agreeable to the development of these resources so long as such developments would not adversely affect the use of the areas for their primary purposes.

725. Several of the State wildlife areas possess adequate nonurban recreation resources to warrant their development for public use. Among the more significant areas are Assowoman Bay, Augustine Beach, Petersburg and Woodland Beach. Each of these essentially wildlife reservations

is capable of fulfilling nonurban recreation needs in addition to hunting and fishing. Such activities as swimming, picnicking, camping (family and group) and boating could be provided without the loss of fish or wildlife values.

STATE BEACH LANDS

726. The State-owned beach lands and associated coastal bays are the most valuable recreation resources of the State. At the present (1959), the administering agency, the State Highway Department, is engaged in a program of general improvement to better accommodate present use demands. A master plan of development is being prepared in cooperation with the State Park Commission.

PROPOSED NEW DEVELOPMENTS

727. The following proposed areas are recommended for addition to the State parks system. The order of arrangement in the plan indicates the recommended priority.

DELAWARE SEASHORE AREA (Sussex County)

Location The Delaware Seashore and Coastal Area extends from Cape Henlopen to the Maryland State line. The portion of this shore referred to in this area comprises the State-owned lands located between Dewey Beach and Fenwick Island. The area is 87 miles southeast of Wilmington. State Route 14 extends through the entire length of the seashore.

Recreation Resources The recreation resources of the Delaware Seashore and Coastal Area includes 10 miles of excellent frontage on the Atlantic Ocean and 20,000 acres of coastal bays. These seashore lands are barrier beaches between the ocean and Rehoboth, Indian River and Little Assowoman Bays. In several places, State lands extend across the barrier and afford frontage on both the ocean and inland bay.

The barrier beach rises from a foreshore of hard white sand, 100 to 150 feet in width, to a foredune with an average height of 10 feet. The land behind the dune falls away gradually to a low marshy area adjacent to the inland bays. The quality of the surf for bathing purposes is fair to good with the better surf areas being in the vicinity of Bethany Beach. The quality of the beach is excellent. The width and character of the terrain between the foredune and the bayshore is suitable and adequate for the necessary physical improvements



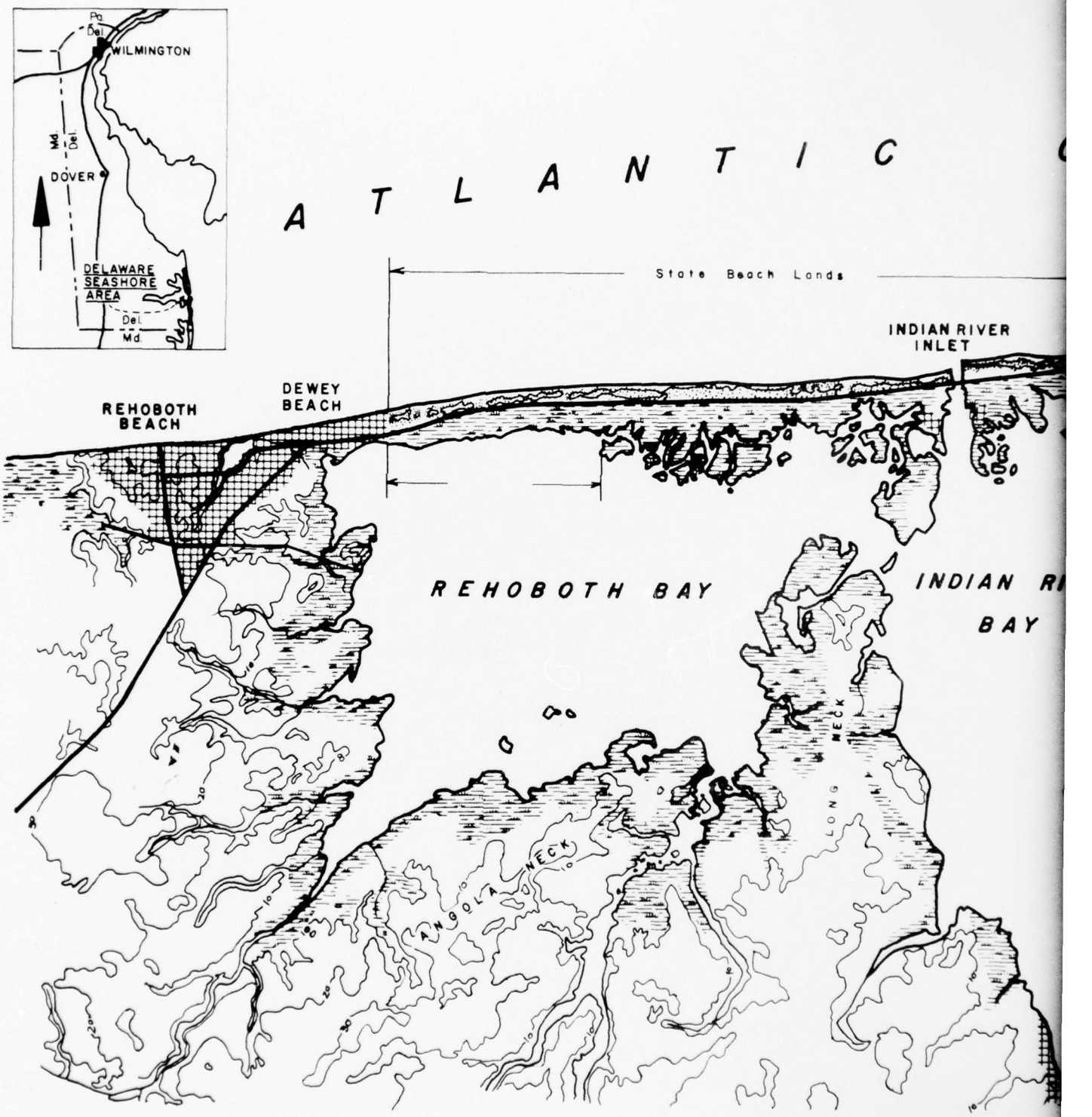
The seashore and coastal area is Delaware's most outstanding recreation resource.

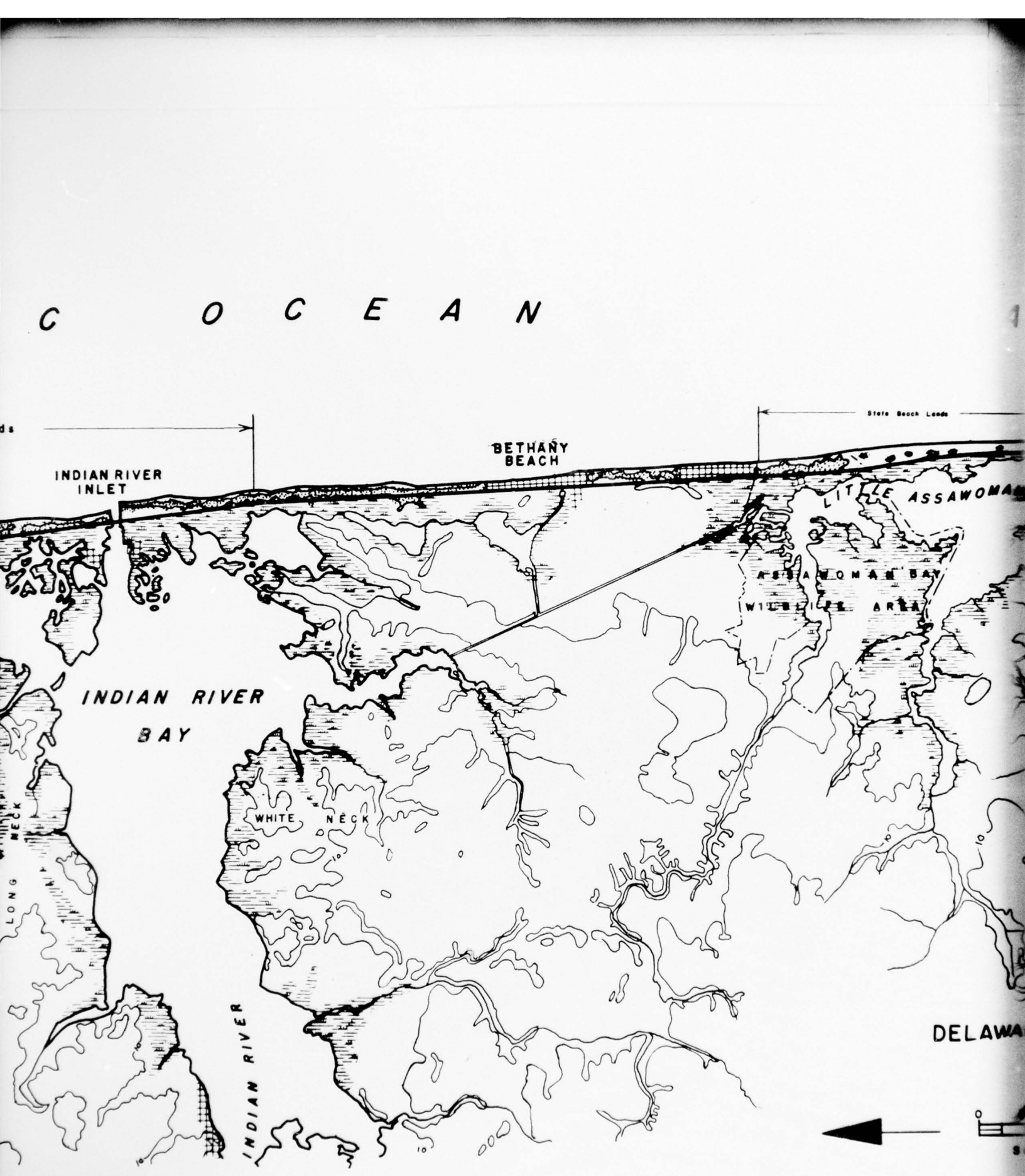
in connection with the recreation use of the beach area.

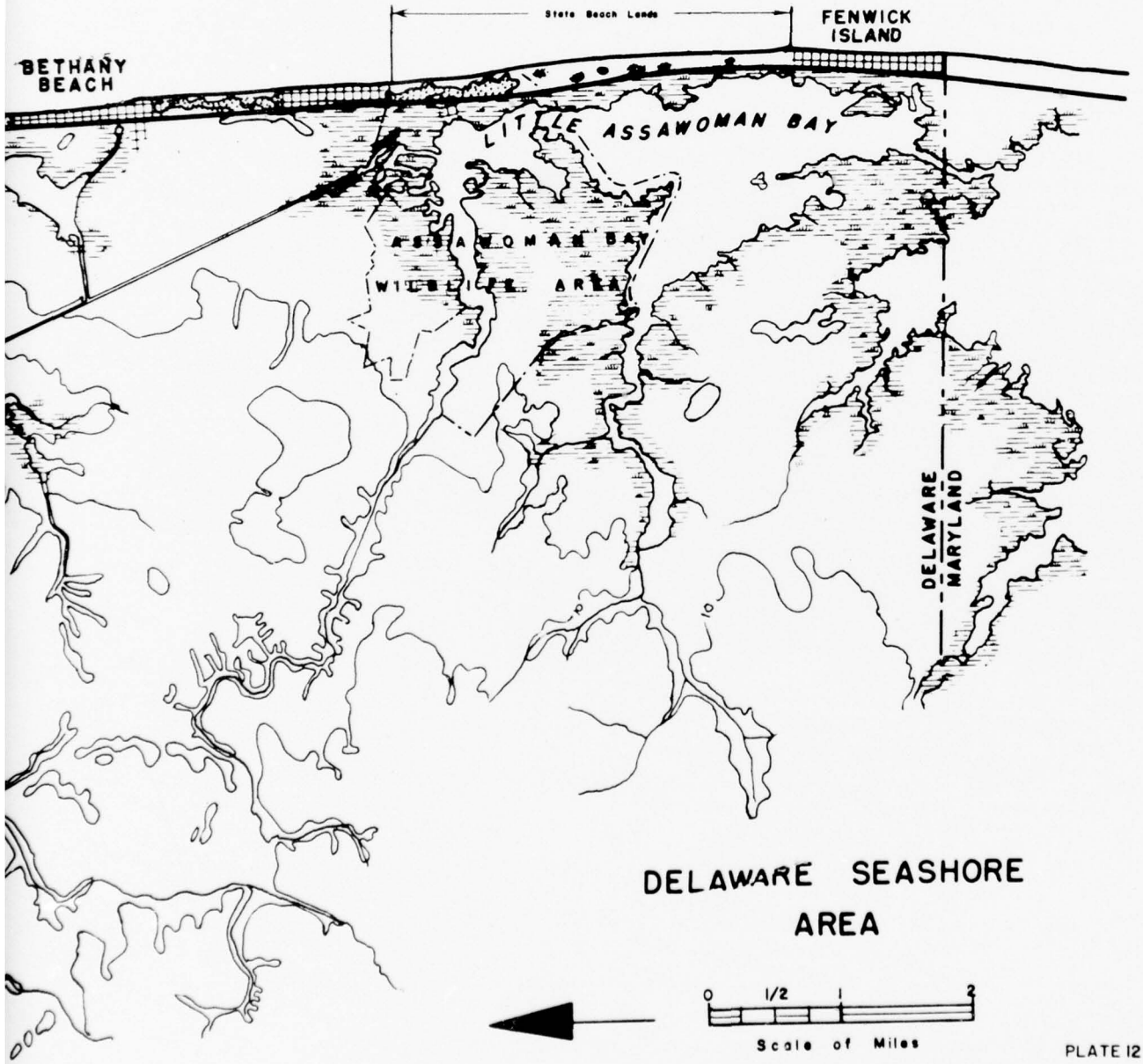
The inland bays add materially to the recreation potential of this coastal area. For the most part, these bays have an average depth of 4 to 7 feet and a hard sand bottom, making them ideal for bay swimming, boating, and other aquatic sports. The water quality is good. the surrounding inland shore is generally high ground, interspersed with marshes. During the migration season, these bays and marshes are used extensively by waterfowl.

In order to protect the aesthetic and recreation values of the present State-owned beach lands, it is recommended that all bay frontage be acquired where these lands adjoin State properties.

Recommended Uses and Activities	It is recommended that the Delaware Seashore and Coastal Area be preserved and developed as a seashore recreation area for appropriate uses associated with a seashore environment. Facilities should be provided for ocean and bay bathing, camping, picnicking, boating, surf and pier fishing, and water sports.
Estimated Annual Visitation	1,000,000
Acreage Requirement	*900 acres
Cost of Physical Improvements	$5,000,000


Pa
Del
WILMINGTON
Md
Del
DOVER
DELAWARE
SEASHORE
AREA
Del
Md
ATLANTIC
State Beach Lands
INDIAN RIVER
INLET
DEWEY
BEACH
REHOBOTH
BEACH
REHOBOTH BAY
INDIAN RI
BAY
LONG NECK
ANGOLA NECK
10
20
30


C O C E A N
State Beach Lands
BETHANY BEACH
INDIAN RIVER INLET
LITTLE ASSAWOMAN
ASSAWOMAN BAY
WILDLIFE AREA
INDIAN RIVER BAY
WHITE NECK
LONG NECK
INDIAN RIVER
DELAWA



DELAWARE SEASHORE AREA

PLATE 12

LUMS POND AREA (New Castle County)

Location Lums Pond is located in the center of New Castle County immediately north of the Chesapeake and Delaware Canal, 16 miles southwest of Wilmington, 32 miles north of Dover and 10 miles south of Newark. The site is bounded by paved roads which provide ready access.

This site is well located with respect to population centers and potential users. In 1956, the population of New Castle County was 291,000. The population within 25 miles of the site is 450,000 and 4.5 million people within 50 miles.

Recreation Resources This area would contain approximately 1,920 acres, including 200 acres of water. The Pond, the second largest body of water within Delaware, has an average depth of 9 feet and the water is of good quality. Fishing for bluegills, bass, crappie, perch, and pickerel is considered to be good. Several species of waterfowl such as Canada geese, mallards, black ducks, wood-ducks and others find refuge on the pond. The irregular character of the shoreline is such as to provide good sites for development, including beaches and boating facilities.

Most of the area included within this site is now or has been cultivated in recent years with the result that little forest



Lums Pond, the second largest impoundment in Delaware

cover remains. Some fields have been abandoned and natural revegetation is in progress. This condition could be improved through reforestation and selective planting. Lack of forest cover is not a deterrent to immediate use and development.

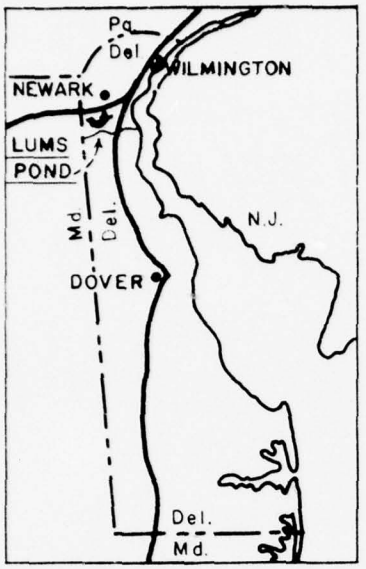
The area presently supports a fair population of small upland game including pheasants, quail, cottontail rabbits, as well as numerous songbirds.

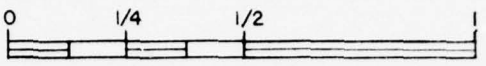
Recommended Purpose and Uses — This area is recommended for development as a State park or recreation area. It is admirably situated to meet the needs for nonurban recreation activities including swimming, picnicking, fishing, field sports, tent camping, organized group camping and boating.

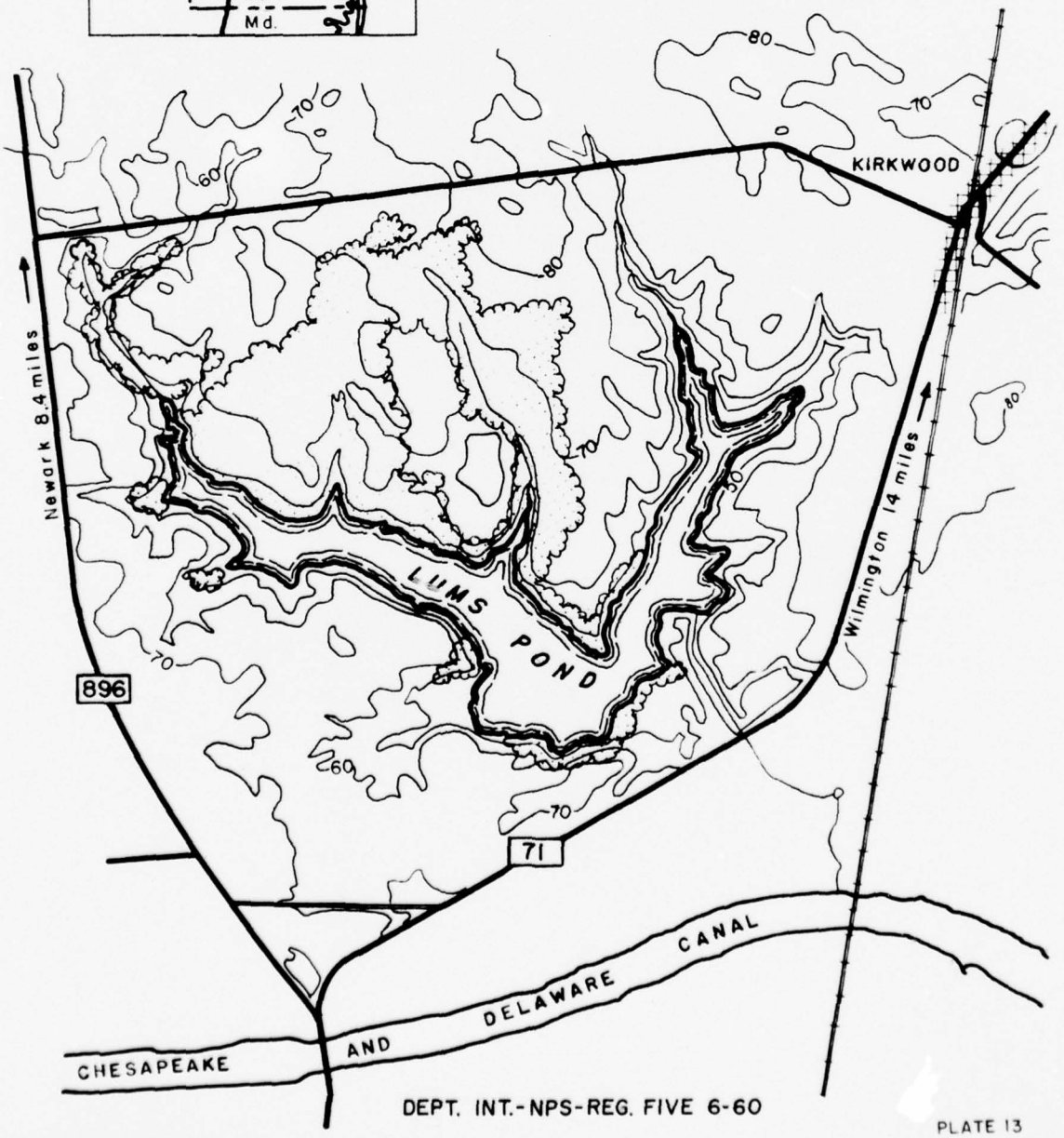
Estimated Annual Visitation	350,000
Acreage Requirement	*1,350 acres
Cost of Physical Improvements	$1,400,000

*In addition to land acquired in 1959

LUMS POND AREA







DEPT. INT.-NPS-REG. FIVE 6-60

PLATE 13

MASON-DIXON INTERSTATE AREA (New Castle County)
Proposed Newark Reservoir Project

Location The Mason-Dixon Interstate Area is located 1 mile north of Newark and 12 miles west of Wilmington. State Routes 72 and 896 provides access to the site.

This area is ideally located with respect to population centers and potential park users. Within a 25-mile radius of the site is a population of 800,000 of which 300,000 reside in Delaware. The number of potential users within a 2-hour driving distance of the site is close to 5 million.

Recreation Resources This site is located in the Piedmont hills, one of the most scenic regions of the State. The topography varies from rolling meadowland to steep, forest covered hillsides. This irregular terrain provides topographic variety found only in the Piedmont section of Delaware.

One of the principal recreation features would be the proposed Newark Reservoir. This impoundment would have a surface area of 1,060 acres with approximately 60 percent of this area in Delaware. The remainder would extend into Pennsylvania. The shoreline would be extremely irregular with long necks of water and promontories of land overlooking the reservoir. This impoundment would be the largest body of water



View upstream through the proposed Newark Reservoir site

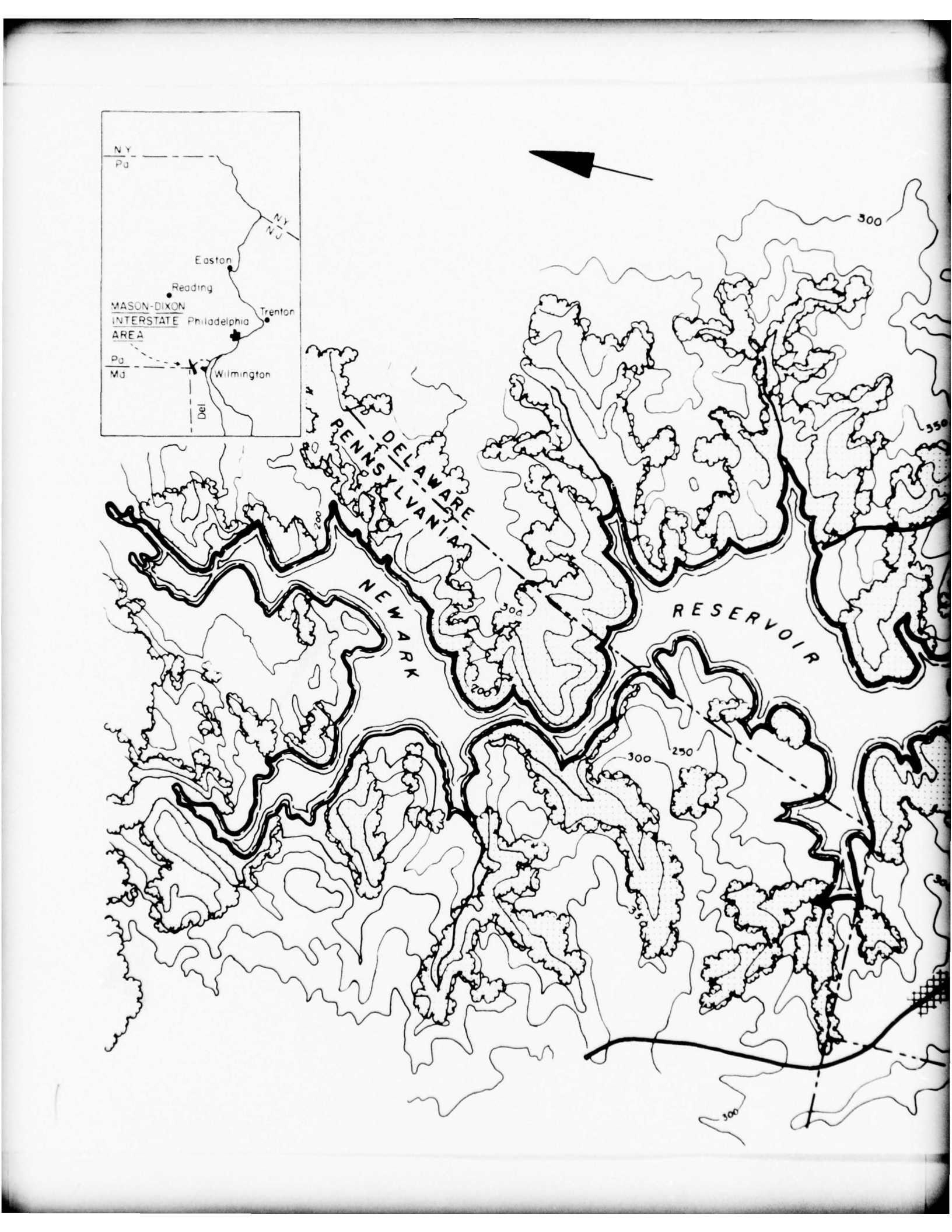
in Delaware available for public recreation.

The forest cover, consisting of mixed hardwoods, is interspersed with open meadowland and agricultural fields. This diversity of cover would provide excellent conditions for the placement of facilities for a wide variety of activities.

The point of beginning of the Mason-Dixon line would be located within this area. Some of the original markers are still to be found. This "line" that once divided the Nation has considerable human interest and would add an unusual feature.

Recommended Purpose and Uses	It is recommended that this area be preserved and developed as an interstate park or recreation area in cooperation with the State of Pennsylvania. The site would provide nonurban recreation opportunities not presently available in Northern Delaware. The plan of development should include facilities for swimming, boating, fishing, picnicking, camping, hiking, organized camping, and related activities.
Estimated Annual Visitation	500,000
Acreage Requirement	*3,000 acres
Cost of Physical Improvements	$3,000,000

*Above flow line of reservoir


N.Y.
Pa
N.Y.
N.J.
Easton
Reading
MASON-DIXON
INTERSTATE
AREA
Philadelphia
Trenton
Pa
Md
Wilmington
Del
DELAWARE
PENNSYLVANIA
NEWARK
RESERVOIR
300
350
250
200

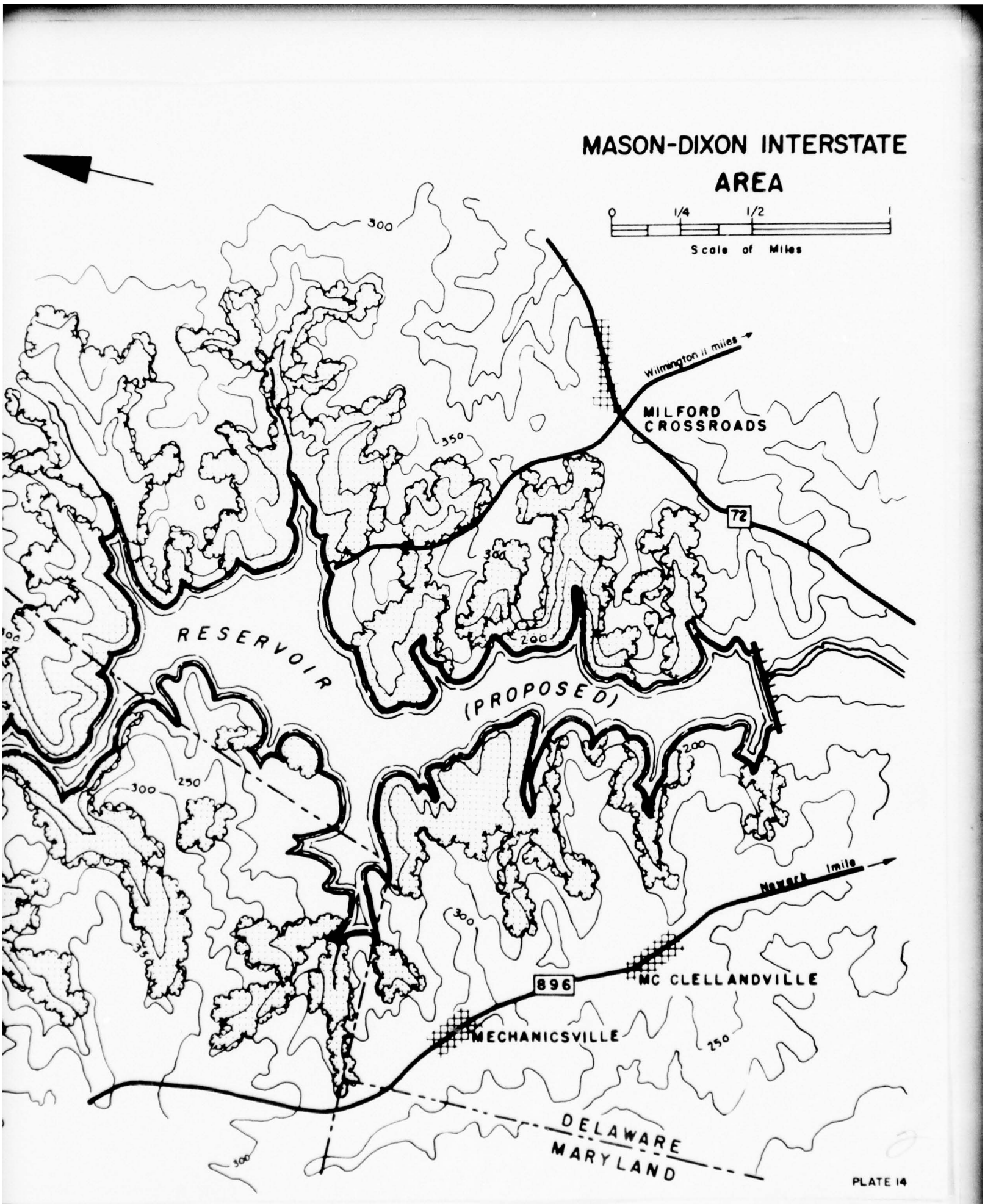

MASON-DIXON INTERSTATE
AREA
0
1/4
1/2
1
Scale of Miles
Wilmington 11 miles
MILFORD
CROSSROADS
72
RESERVOIR
(PROPOSED)
Newark 1mile
896
MC CLELLANDVILLE
MECHANICSVILLE
DELAWARE
MARYLAND
300
350
250
200

PLATE 14

KILLEN-COURSEY-McCAULEY PONDS AREA (Kent County)

Location The Killen-Coursey-McCauley Ponds area is located in the drainage basin of the Murderkill River between U.S. 13 and U.S. 113.

This site is favorably located with respect to the population centers of the county and the State. Dover and Milford are 10 and 6 miles distant respectively. Wilmington and Newark are within a driving time of approximately 1 hour. Approximately 75,000 Delaware residents live within 25 miles of this site and the entire population of the State (390,000) lives within a driving time of one and one-half hours.

Recreation Resources This area would contain Killen, Coursey, and McCauley Ponds and that section of the Murderkill River from U.S. 113 at Frederica to the toe of the dam at Coursey Pond, and Brown's Branch from its confluence with the Murderkill River to the toe of the dam at McCauley Pond. The area would include approximately 200 surface acres of water in the three ponds and 3,400 acres of land.

The three ponds located within this area are typical of the many millponds found throughout the State. The average depth varies from 6 to 9 feet. The water quality is good and supports a fair population of fish. Shorelines are irregular and contain many bays and



Killen Pond

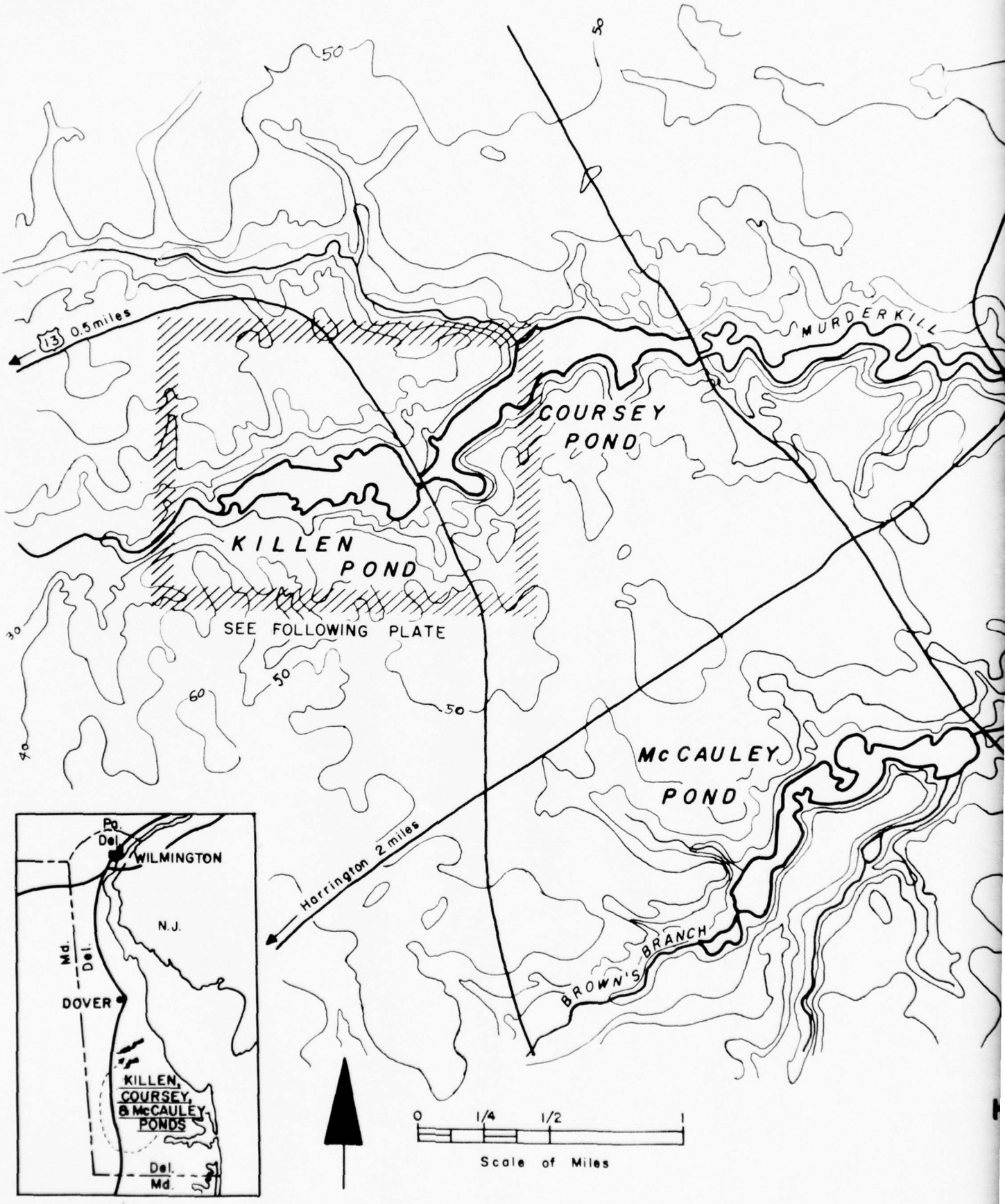
points. The pond shores are relatively high and well-wooded for varying depths back from the water's edge. Some sections of the shoreline are low and marshy and provide a good fish habitat.

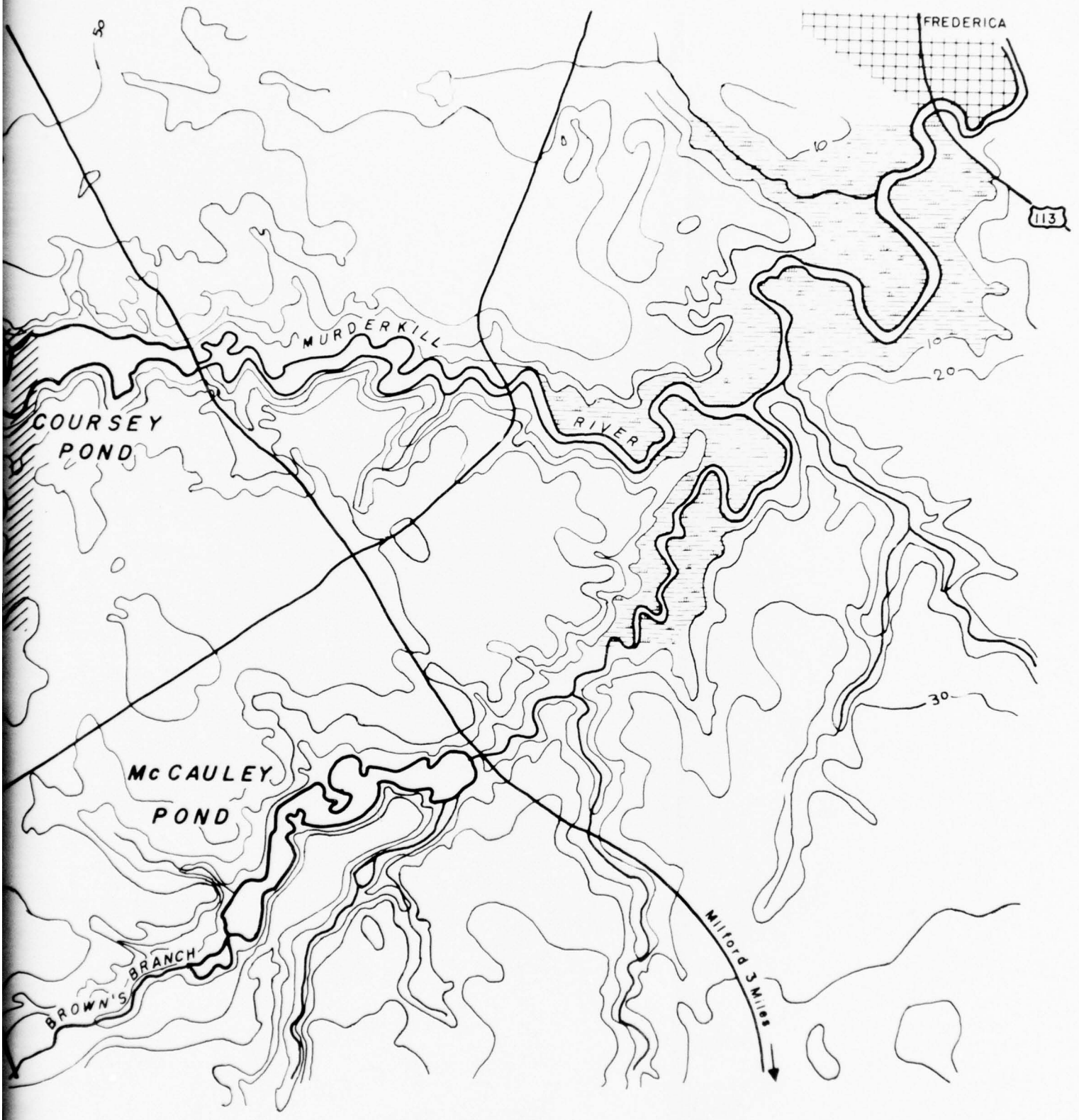
The Murderkill River from U.S. 113 to Coursey Pond is a wide brackish marsh which if dammed at the highway would create a shallow lake of particular value to waterfowl.

Recommended Purpose and Uses — It is recommended that the Killen-Coursey-McCauley Ponds Area, including the Murderkill River and Brown's Branch, be acquired as a unit and developed as a State park or recreation area. Killen Pond should be the first unit in this development in view of its very favorable topography, size of pond and accessibility. As the need for additional space and facilities materialize, Coursey and McCauley Pond sites could be used.

This area would provide adequate space for all appropriate nonurban recreation activities such as swimming, fishing, boating, camping, picnicking, nature study, group camps, etc.

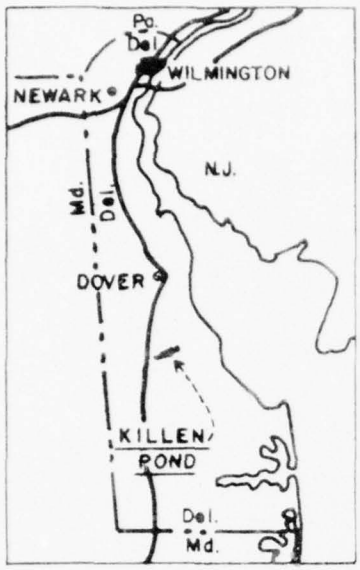
Estimated Annual Visitation	300,000
Acreage Requirement	3,600 acres
Cost of Physical Improvements	$1,200,000


50
50
13 0.5miles
MURDERKILL
COURSEY POND
KILLEN POND
SEE FOLLOWING PLATE
30
60
50
50
40
McCAULEY POND
Harrington 2miles
BROWN'S BRANCH
Pa.
Del.
WILMINGTON
N.J.
Md.
Del.
DOVER
KILLEN, COURSEY, & McCAULEY PONDS
Del.
Md.
0
1/4
1/2
1
Scale of Miles



KILLEN, COURSEY, & McCAULEY PONDS

PLATE 15


Pa.
Del.
WILMINGTON
NEWARK
N.J.
Md.
Del.
DOVER
KILLEN
POND
Del.
Md.


30
20
KILLEN
30
20
40


KILLEN POND
0
1/8
1/4
Scale of Miles
13
2.5 miles
COURSEY POND
KILLEN POND
30
20
30
20
50
Houston 5 Miles

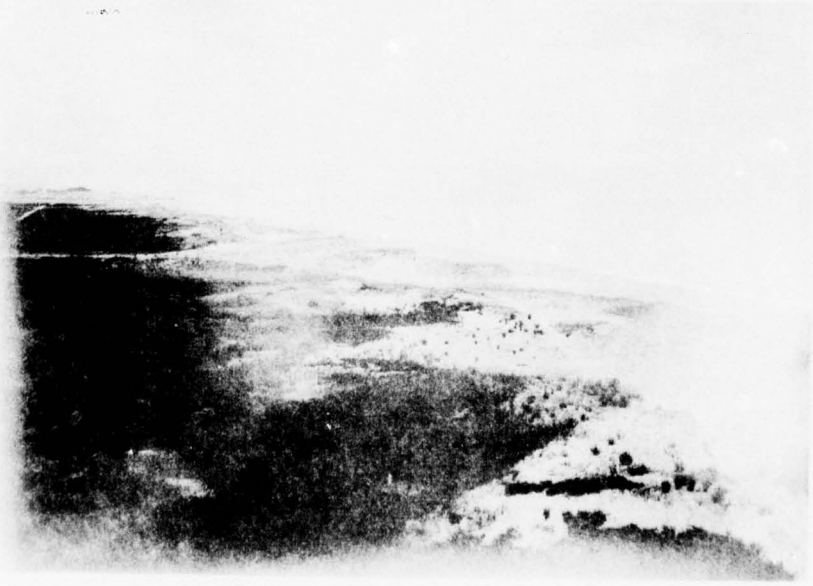
PLATE 16

DELAWARE DUNES (Sussex County)

Location The Delaware Dunes comprise most of the seashore lands north of Rehoboth Beach and east of the Lewes and Rehoboth Canal. The total area includes State-owned beach lands surrounding Gordon Pond, the Fort Miles Military Reservation located on Cape Henlopen, and certain private lands southeast of the Town of Lewes.

Recreation Resources This sand dune and marsh area constitutes one of the few remaining natural areas in Delaware. The present State-owned lands (1,060 acres) have been altered somewhat through the draining of Gordon Pond. The State lands contain significant dune formations with elevations up to 35 feet.

Five ecological niches are represented within this area: (1) Beach, practically barren of vegetation; (2) Dunes, sparsely covered by beach grasses, succulents and semisucculents; (3) Groundsel bush-bayberry association, containing many interesting plants including several species of orchids; (4) Pine Barrens, a uniquely characteristic feature of the Coastal Plain, composed primarily of pitch pine; (5) Marsh, important primarily as a wildlife habitat for waterfowl, rails, waders, and marsh hawks. The occurrence of these five distinct ecological niches with their strongly differing life forms



Delaware sand dunes

makes these dune lands important as a natural area. When and if the Fort Miles Military Reservation becomes surplus to the needs of the Federal government, this area should be added to the proposed park.

Recommended Purpose and Uses	The highest value of this area would be in its preservation as a State park. The ecological communities associated with the sand dunes, pineland, marsh, and contiguous seashore, should be preserved for their intrinsic values as an outstanding example of a seashore environment. The use of this area should be confined to foot travel without trails from a parking space provided at the south ridge of the park.
Estimated Annual Visitation	100,000
Acreage Requirement	*1,000 acres
Cost of Physical Improvements	$300,000

*Presently State owned

LONG NECK AREA (Sussex County)

Location Long Neck is a peninsula separating Rehoboth Bay from Indian River Bay and extends to within one-half mile of Burton Island, a portion of the barrier beach.

The area is located 8 miles south of Rehoboth Beach and 50 miles southeast of Dover and is accessible over Long Neck Road from State Route 24.

Recreation Resources The principal recreation values of Long Neck are concerned with its extremely advantageous location with respect to Rehoboth and Indian River Bays. This site separates these two very large landlocked bodies of water and provides points of access to both. These bays are outstanding water recreation resources for boating (power, sail or canoe), fishing, clamming, and swimming. The many coves, tributary rivers and creeks are inducements for exploring and shoreline sightseeing.

The land area and shoreline of Long Neck is such as to render it adaptable for development in order to utilize the tremendous recreation resources of the two bays. High ground, much of it covered by pine forests, is suitable for such purposes as picnic and camping areas. The irregular shoreline presents excellent sites for boat basins swimming areas, and boat launching. The development of this site would,

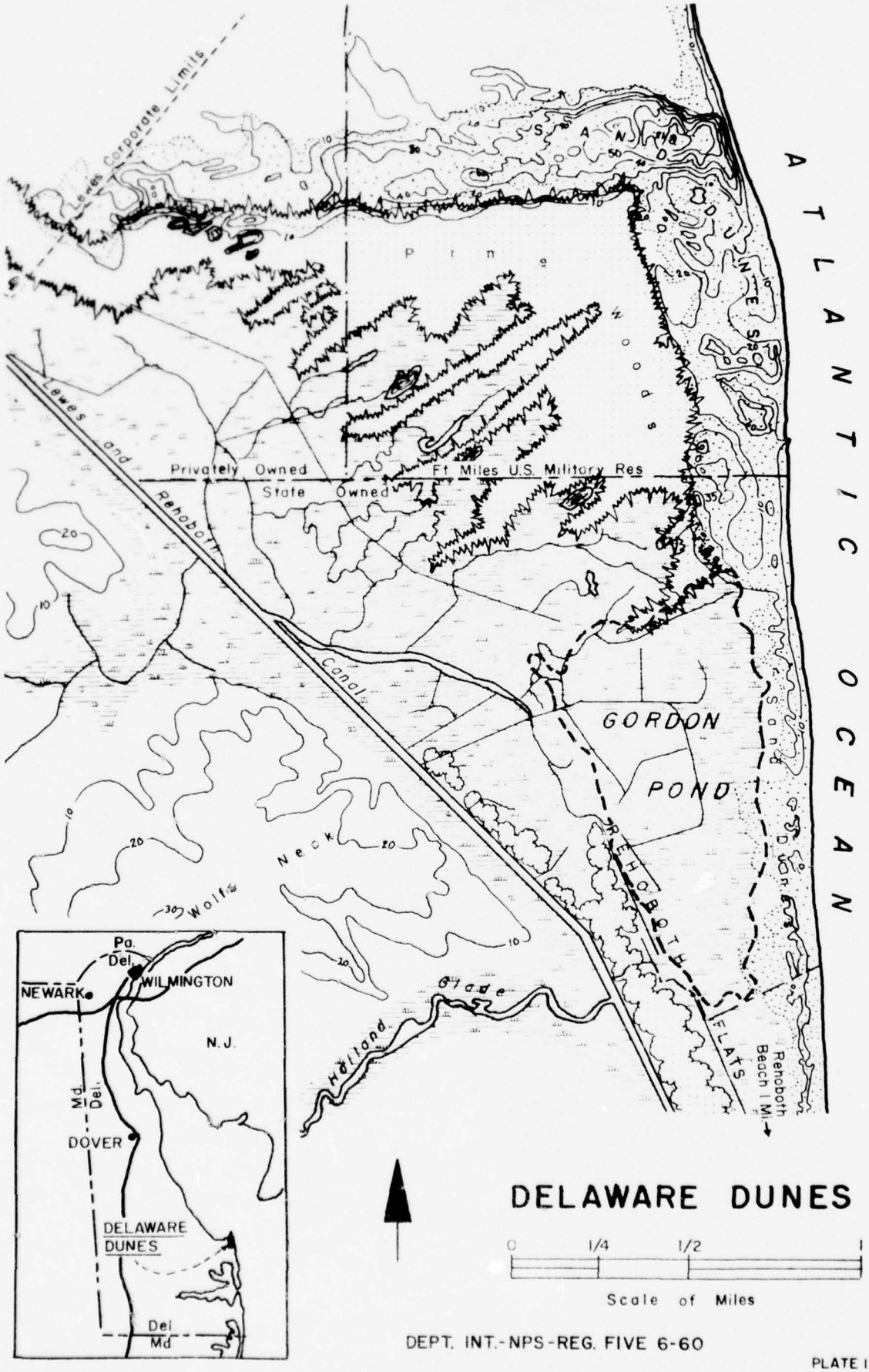


Long Neck provides access to Rehoboth and Indian River Bays.

for all practical purposes, incorporate the land area and the two bays into one massive water recreation area. The Long Neck development would constitute the focal point from which all activities would radiate.

Recommended Purpose and Uses — It is recommended that the Long Neck area be developed as a State park or recreation area so as to more fully utilize the recreation resources of Rehoboth and Indian River Bays. The site is suited for the development of facilities for camping, picnics, boating, swimming, fishing, and field sports.

Estimated Annual Visitation	100,000
Acreage Requirement	1,500 acres
Cost of Physical Improvements	$400,000



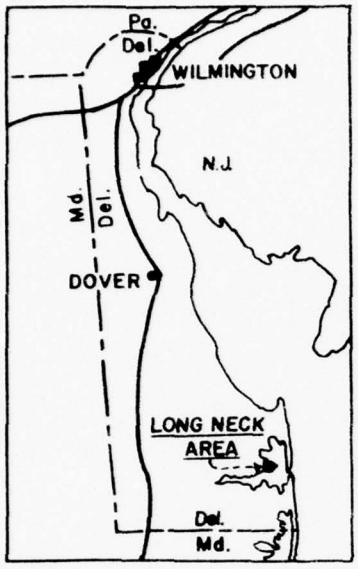
DELAWARE DUNES

0 1/4 1/2 1

Scale of Miles

DEPT. INT.-NPS-REG. FIVE 6-60

PLATE 17



LONG NECK AREA

0 1/4 1/2 1

Scale of Miles

REHOBOTH BAY

Nats Cove

Roman Pond

LONG NECK ROAD

Steels Cove

Middle Island

White House Cove

BURTON ISLAND

INDIAN RIVER BAY

DEPT. INT.-NPS-REG. FIVE 6-60

PLATE 18

TRUSSEM POND AREA (Sussex County)

Location Trussem Pond is located 4 miles southeast from Laurel and 2 miles west of Trap Pond State Park. The pond is a 92-acre impoundment on James Branch, a tributary of Broad Creek which drains into Nanticoke River. The site is accessible over a paved road.

Recreation Resources The principal recreation resources of this area are those associated with a rather unique natural setting. The 92-acre pond, studded with a stand of bald cypress 20 to 30 feet tall and 8 to 12 inches in diameter above the buttress, is the outstanding feature. Immediately below the dam is a small forest of mature cypress up to 60 feet tall and with diameters up to 3 feet. Associated with the cypress on this swampy site are American holly, red maple, azalea, ash, and southern white cedar. Surrounding the pond and swamp forest are a variety of deciduous and coniferous species characteristic of Coastal Plain forests. These include sweet gum, mulberry, fringe tree, mountain laurel, loblolly pine, sweet bay, eastern dogwood, numerous species of oak, wild grape, Virginia creeper and a wide variety of lesser plants. This site is one of the northernmost examples of a typical cypress forest containing a great variety of plant species usually associated with more southern climes.

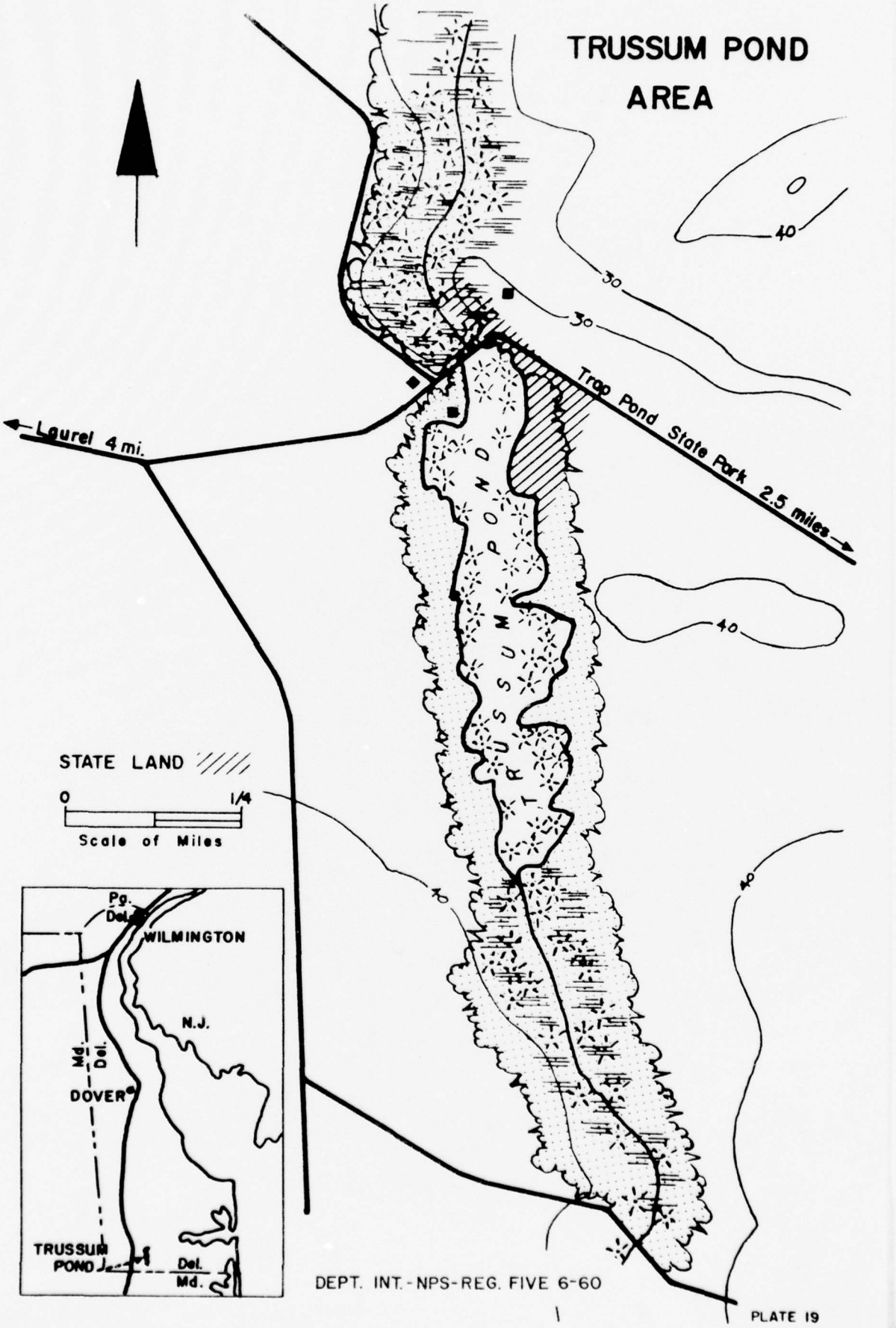


Delaware's unique cypress pond.

Recommended Purpose and Uses — The Trussem Pond Area is recommended for preservation as a nature preserve to perpetuate a forest type now rare to nonexistent elsewhere in the State. The uses to be made of this area should be those associated with nature study and observations in a nature museum.

An adequate site exists for the development of a small roadside park for picnics and boat launching. Fishing in the pond would not mar or detract from the primary purpose of the area.

Estimated Annual Visitation	10,000
Acreage Requirement	500 acres
Cost of Physical Improvements	$30,000



DEPT. INT. - NPS - REG. FIVE 6-60

PLATE 19

CHURCHMAN'S MARSH AREA (New Castle County)

Location Churchman's Marsh is located at the confluence of the Christina River and White Clay Creek, 5 miles southwest from the center of Wilmington and 7 miles east of Newark. Churchman's Road and Hogswamp Road provide access to the site.

This site is conveniently located with relation to population centers of the State. The 1956 population of New Castle County was 291,000 and within 25 miles of the site there are approximately 750,000 people.

Recreation Resources Although this site was relatively well-known by settlers almost 300 years ago, it has generally withstood the encroachment of man's industrial progress and today it remains much as it must have appeared when seen by the first settlers who came to the colony on the Delaware.(52)

The recreation resources of this area are concerned primarily with the biological environment of a fresh to brackish marsh approximately one square mile in extent. The principal plants of this marsh are wild rice, arrow arium, spatterdock, and others. More than 80 species of birds have been recorded and at least 30 species are dependent wholly or in part upon a marshy or wetland habitat such as



Churchman's Marsh at the confluence of White Clay Creek and the Christina River.

occurs at this site. Numerous species of waterfowl use this small area during the migration seasons and ducks may be seen at almost any time.

It is generally agreed that the Churchman's Marsh area does possess certain archaeological values. Although the area has not been explored in a scientific manner, there appears to be sufficient evidence to indicate that the area supported an extensive Indian occupation. Literally thousands of Indian artifacts have been collected from the cultivated fields bordering White Clay Creek.(52)

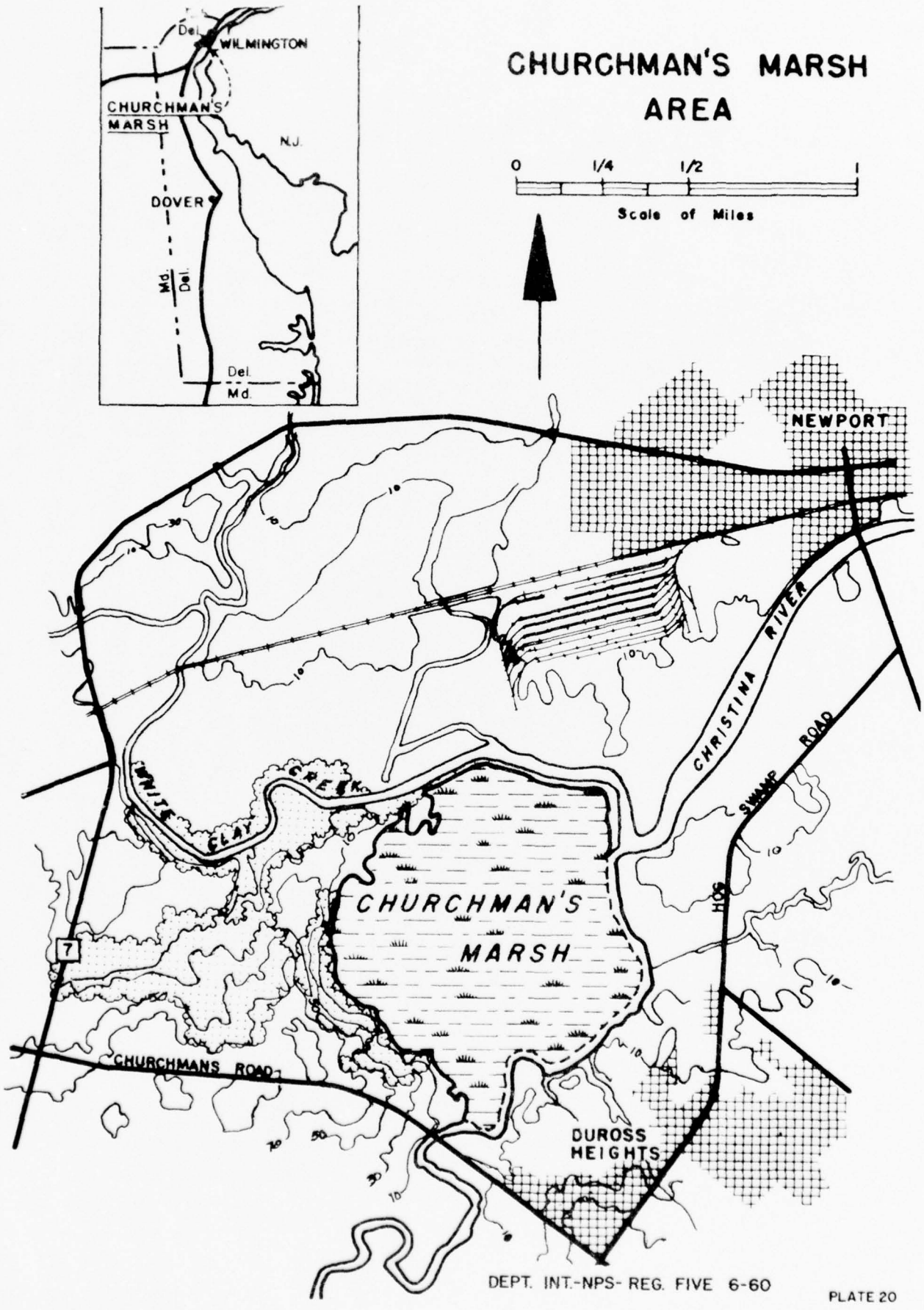
The proximity of this site to population concentrations renders it particularly valuable as a study site for scientists, naturalists, nature lovers and school groups.

The wooded areas and open field on the high ground to the west of the marsh is readily adaptable to recreation purposes associated with visits to the marsh.

Recommended Purpose and Uses — It is recommended that Churchman's Marsh be preserved as a nature preserve representative of a marsh habitat for plants and animals. Nature study, observation of plants and animal life, birdwatching, photography, and related activities should constitute the primary uses of this outdoor museum.

The high ground adjacent to the marsh lends itself to limited development for picnicking and related activities.

Estimated Annual Visitation	15,000
Acreage Requirement	1,500 acres
Cost of Physical Improvement	$45,000


CHURCHMAN'S MARSH AREA
0 1/4 1/2 1
Scale of Miles
Del.
WILMINGTON
CHURCHMAN'S MARSH
N.J.
DOVER
Md.
Del.
Del.
Md.
NEWPORT
CHRISTINA RIVER
SWAMP ROAD
WHITE CLAY CREEK
CHURCHMAN'S MARSH
7
CHURCHMANS ROAD
DUROSS HEIGHTS
DEPT. INT.-NPS- REG. FIVE 6-60
PLATE 20

COOCH'S BRIDGE (New Castle County)

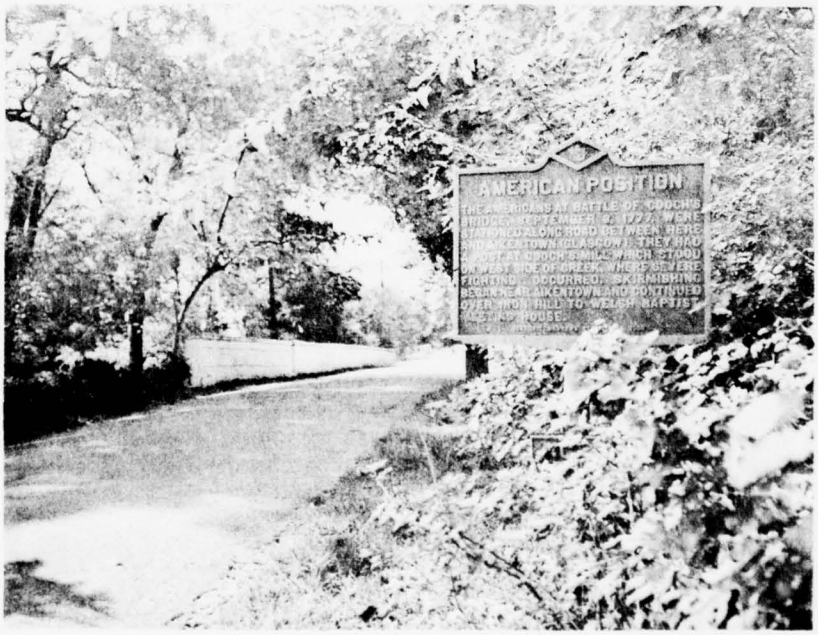
Location Approximately 1-1/2 miles southeast of the city line of Newark.

Historical Value The only engagement of the American Revolution on Delaware soil was fought at Cooch's Bridge. American light infantry and cavalry under General William Maxwell encountered the advance guard of British and Hessian troops in this vicinity on September 3, 1777.

Recommended Purpose and Uses It is recommended that the State set aside a suitable area, including the bridge and the Cooch residence, and a historical park be created and developed. This development should include proper interpretive devices to tell the story of this battle.

Development Cost

Land (15 acres)	$50,000
Physical Improvements	$50,000



Cooch's Bridge

BUENA VISTA (New Castle County)

Location The house is located 9 miles south of Wilmington on U.S. Highway 13.

Historical Value The brick home of John Middleton Clayton (1796-1856) was completed in 1846. Clayton was Chief Justice of the State of Delaware, United States Senator and Secretary of State under President Zachary Taylor. Clayton named his home in honor of Taylor's victory (1847) in the Mexican War.

Recommended Purpose and Uses It is recommended that this house be preserved for the benefit and enjoyment of the people of Delaware. Although not threatened with destruction at this time, a responsible organization (public or private) should acquire it at the earliest possible moment. It should be restored, developed, and properly interpreted for the benefit of the visitor.

Development Costs

Land (15 acres)	$90,000
Physical Improvements	$10,000



"Buena Vista" the former home of John Middleton Clayton

MACDONOUGH HOUSE (New Castle County)

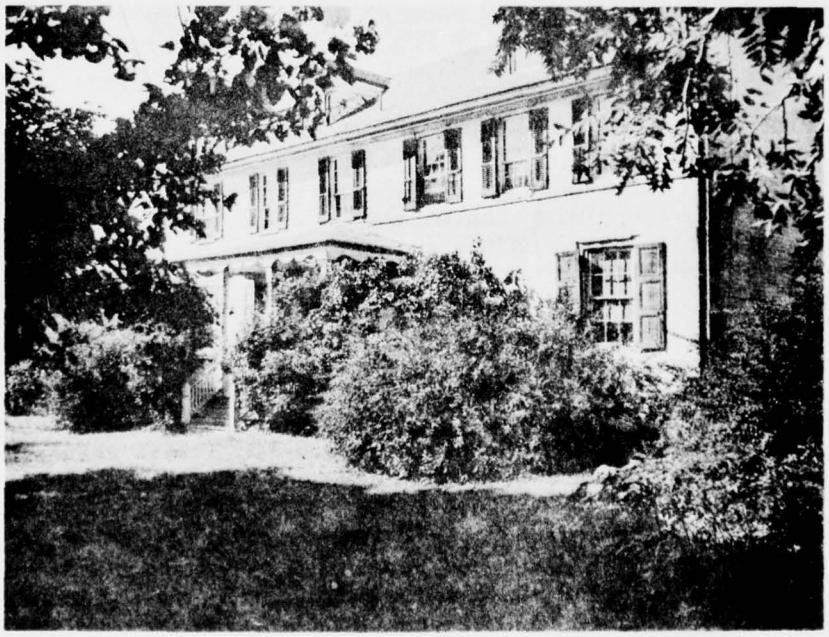
Location McDonough, 2-1/2 miles north of Odessa on U.S. Highway 13.

Historical Value The early home of Commodore Thomas Macdonough, hero of the Battle of Lake Champlain (1814) during the War of 1812. Macdonough distinguished himself in the Barbary Wars (1801, 1805, 1815) by assisting Commodore Decatur in capturing and burning the "Philadelphia". The original name of the settlement where the house is located was "The Trap" but was changed to McDonough in 1814.

Recommended Purpose and Uses It is recommended that this house be preserved for the benefit and enjoyment of the people of Delaware. Although not threatened with destruction at this time, a responsible organization (public or private) should acquire it at the earliest possible moment. It should be restored, developed, and properly interpreted for the benefit of the visitor.

Development Costs

Land (2 acres)	$20,000
Physical Improvements	$15,000



Former home of Commodore Thomas Macdonough

WAYSIDES

728. Roadside parks have gained wide public acceptance and popularity in recent years. They afford the traveler an opportunity to escape from the hurry of the highway for a brief period, and are places where he may rest, eat lunch, enjoy the natural scenery, then go on his way refreshed. Thus, they fill a threefold purpose; they contribute to highway safety, they preserve scenic beauty, and they are convenient for those who wish to eat along the highway. In general, these parks should range in size from one to five acres. The land comprising the park should be in addition to the normal highway right-of-way width, but contiguous to it.

729. Roadside parks should provide, as minimum facilities, parking space well off the highway, safe drinking water, comfort stations, picnic tables with benches, fireplaces, and refuse containers. Wherever possible, the area should be screened from the highway. A layout for a typical roadside park appears in Plate 21.

730. It is recommended that roadside parks be developed along the following highways: U.S. 13, 113, 202, 40, and Delaware 14 between Milford and Rehoboth Beach. Picnic tables have been placed along these routes; however, much remains to be desire in regard to site selection, development, and facilities.

PHASE TWO

731. The following described recreation land reserves are recommended for acquisition as a part of PHASE ONE and held for development after 1980.

PROPOSED RECREATION LAND RESERVES

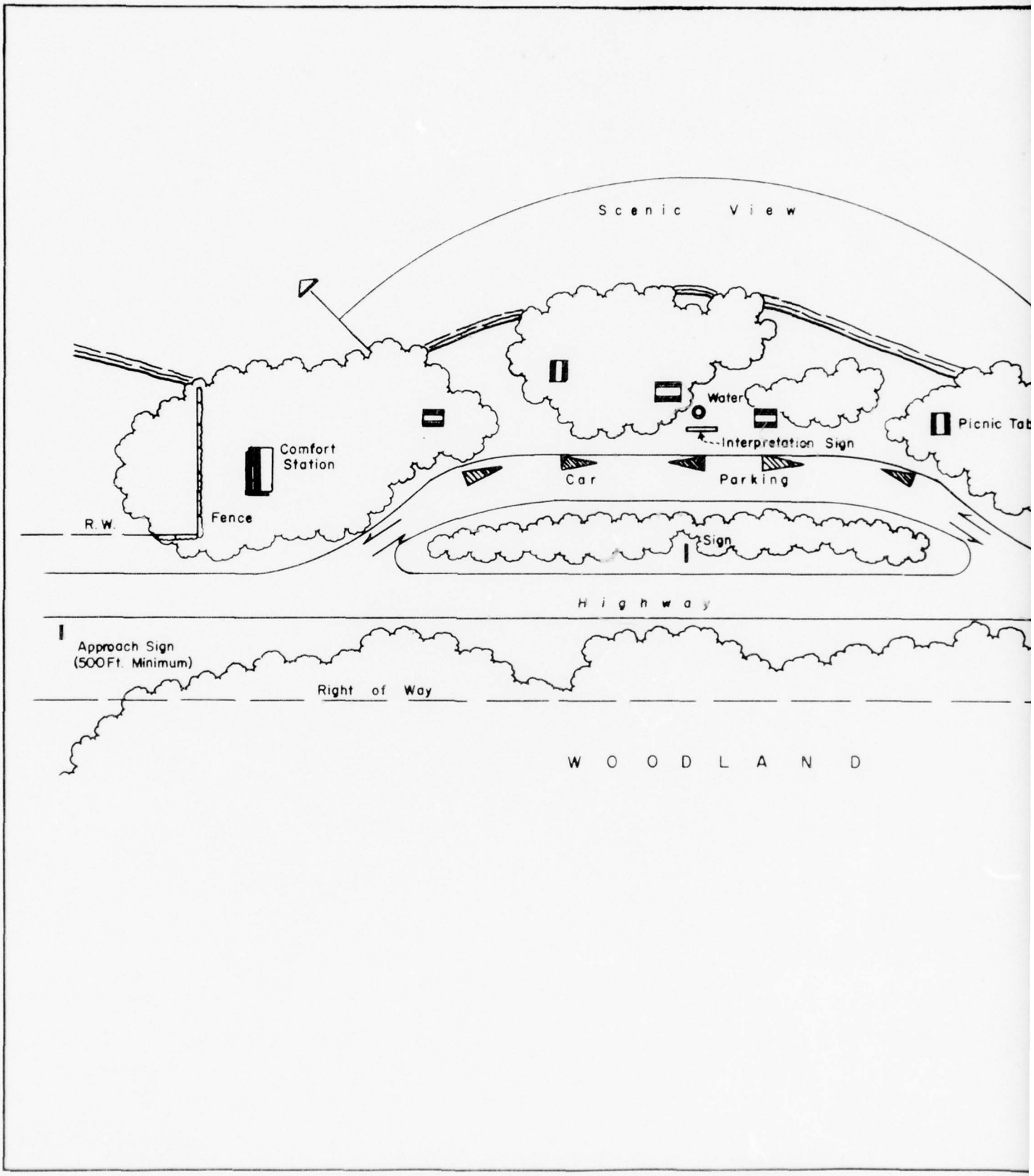
Cape Henlopen (Fort Miles Military Reservation)(Sussex County)

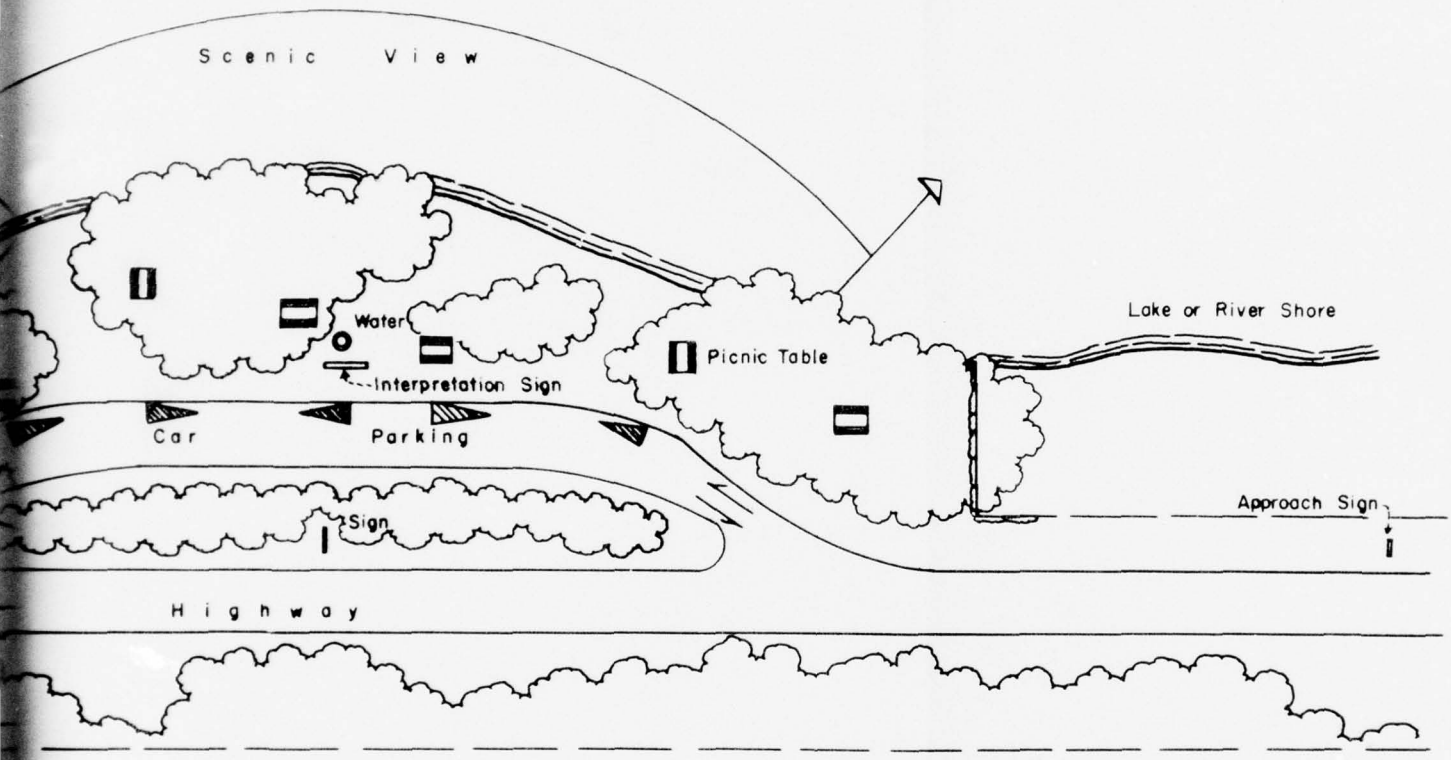
732. Included within this military reservation are approximately 2,000 acres of land containing the most spectacular sand dunes in the State and excellent frontage on the Atlantic Ocean and Delaware Bay. The dunes rise to an elevation of 85 feet and the beaches are among the finest along the State's entire shoreline. Stunted pine forests cover much of the dune area.

733. When and if this reservation becomes surplus to the needs of the Federal government, it should be acquired for addition to the proposed Delaware Dunes State Park because of its biological values and the excellent opportunities it could provide for seashore recreation.

South Shore of Indian River Bay (Sussex County)

734. One or more publicly-owned nonurban recreation areas are needed on the South Shore of Indian River Bay in order to safeguard the recreation resources of this extensive water area for public use. The bay is now in State-ownership and this should be complemented by adequate publicly-owned shorelands. In view of private cottage


Scenic View
Water
Picnic Tab
Interpretation Sign
Comfort Station
Car
Parking
R.W.
Fence
Sign
Highway
Approach Sign
(500Ft. Minimum)
Right of Way
WOODLAND



TYPICAL WAYSIDE PARK

0 40 80
Scale in Feet

PLATE 21

developments in this general region, further delay in the acquisition of desirable sites may in time preclude public access to this publicly owned water recreation area.

735. In view of the State's proposed development of its beachlands in the vicinity of Indian River Inlet, it would appear that the south shore of the bay, in a very short time, will become saturated with private developments. Excellent sites are available for cottages, boat launching and fishing facilities. The timely acquisition of suitable sites for public use is essential to guarantee the public's right to use the recreation resources of Indian River Bay.

West Shore of Rehoboth Bay (Sussex County)

736. In order to safeguard the tremendous recreation values of Rehoboth Bay for the benefit of the public, it is recommended that as much of the western shore as possible be acquired for eventual development. In view of the relatively limited extent of ocean front property remaining available to realtors, this area will become increasingly desirable for cottage sites and other restrictive uses.

737. The market value of this shore is relatively low in view of the generally marshy conditions which prevail. This cannot be considered as a safeguard against commercial exploitation or as lessening the potential recreation value. The same methods of dredging and filling to create real estate values could be used to create recreation sites of inestimable value for public use.

Proposed Christiana Reservoir Project (New Castle County)

738. The proposed impoundment of the Christiana River will create a reservoir of 2,900 surface acres 4 miles southeast of Newark and 11 miles southwest of Wilmington. The shoreline will be extremely irregular with innumerable necks and bays. The surrounding topography is gently rolling and characteristic of the Coastal Plain. The lands surrounding this proposed impoundment are predominately cleared and presently used for agriculture.

Woodland Beach (Kent County)

739. Woodland Beach is located on the Delaware River south of the Woodland Beach Wildlife Area, administered by the Board of Game and Fish Commissioners for public hunting and fishing. It is 3 miles north of Bombay Hook National Wildlife Refuge. The Board of Game and Fish Commissioners has expressed an interest in acquiring the corridor of land between these two areas. If acquired the hamlet of Woodland Beach would be encircled by publicly-owned land.

740. This river front cottage community is a relic of a bygone period when "trolley parks" and "ferry parks" catered to the recreation needs of the "horse and buggy era". At least two of the factors contributing to the decline of this area were the deterioration of water quality in the Delaware River and the need for recreation closer to home, the potential value of Woodland Beach as a public recreation

area appears to be increasing.

741. In view of the increasing demand for water front property and the scarcity of desirable beach or high ground along the river, this site should be acquired for future development consistent with the demand for river front recreation facilities.

Becks Pond and Sunset Lake (New Castle County)

742. Becks Pond now in State-ownership was restored in 1956 by the Board of Game and Fish Commissioners and is managed as a public fishing area. With adequate shore land this body of water containing approximately 50 acres would be valuable for nonurban recreation, particularly as a day-use area.

743. Sunset Lake is one of the better impoundments in New Castle County. It is presently in private ownership and closed to public use. The setting of this lake is very pleasing and would be readily adaptable as a public recreation area.

744. The location of these impoundments in relation to the densely populated northern portion of New Castle County increases their value for public recreation. The acquisition of Sunset Lake and surrounding lands and lands surrounding Becks Pond would constitute recreation land reserves of tremendous value in view of the limited availability of recreation water and the rapidly expanding suburban developments in New Castle County.

Voshell Pond (Kent County)

745. This 31 acre millpond is typical of those found throughout the State. Natural physical conditions make this a good fish pond. Water temperatures do not exceed the safe limit for favorite game species. Fishing for bass and pickerel is considered excellent. The pond is surrounded by a narrow fringe of tree growth, outside of which are cultivated fields.

746. The principal value of the site is its favorable location with respect to Dover, the second largest city in the State. As a recreation land reserve, reforestation and selected planting would re-establish a pleasing environment for nonurban recreation use.

Red Mill Pond (Sussex County)

747. This impoundment is in the Broadkill Watershed and receives drainage from approximately 5,000 acres of which 80 percent are wooded and 20 percent cultivated. This is one of the larger ponds in the State, having a surface area of more than 150 acres. Water rights are privately-owned.

748. The land surrounding Red Mill Pond supports a better than average stand of pine and hardwood and creates a most pleasing sylvan environment close to ocean beaches. Acquisition and eventual development of this site would provide fresh-water fishing, swimming and

boating, and an opportunity for forest camping and picnicking. Ocean beaches at Lewes and Rehoboth Beach are readily accessible from this site.

Augustine Beach (New Castle County)

749. The Board of Game and Fish Commissioners now administers 100 acres of frontage on the Delaware River as a boat launching site and recreation area for swimming, fishing, and boating. This area is located on the site of what was at one time a favored and intensively used private recreation development. In view of recent improvement of water quality in the Lower Delaware River, it would appear that the recreation uses of these better river beaches will materially increase in the future.

750. The dredging of an anchorage area in the river south of Reedy Point and the filling of the off-shore shallows from Reedy Point to Reedy Island, when completed, would create an excellent protected basin which could be developed into an outstanding marina. The filled area and the adjacent mainland should be considered for addition to the present and expanded holdings at Augustine Beach.

Ingrams Pond (Sussex County)

751. This 50-acre pond is owned by the State, having been restored in 1957 by the Board of Game and Fish Commissioners as a public fishing area. The shores are well-wooded by better than average stands of pine. The acquisition and development of surrounding lands would provide ample opportunities for the full utilization of the recreation resources of this impoundment.

Smalley's Pond (New Castle County)

752. The principal value of this pond for nonurban recreation is concerned with its favorable location with regard to the densely populated northern portion of New Castle County. The present use of this 60-acre pond for domestic water may in time be discontinued in favor of more abundant supplies, in which case it should be acquired for recreation purposes.

Collins Mill Pond (Sussex County)

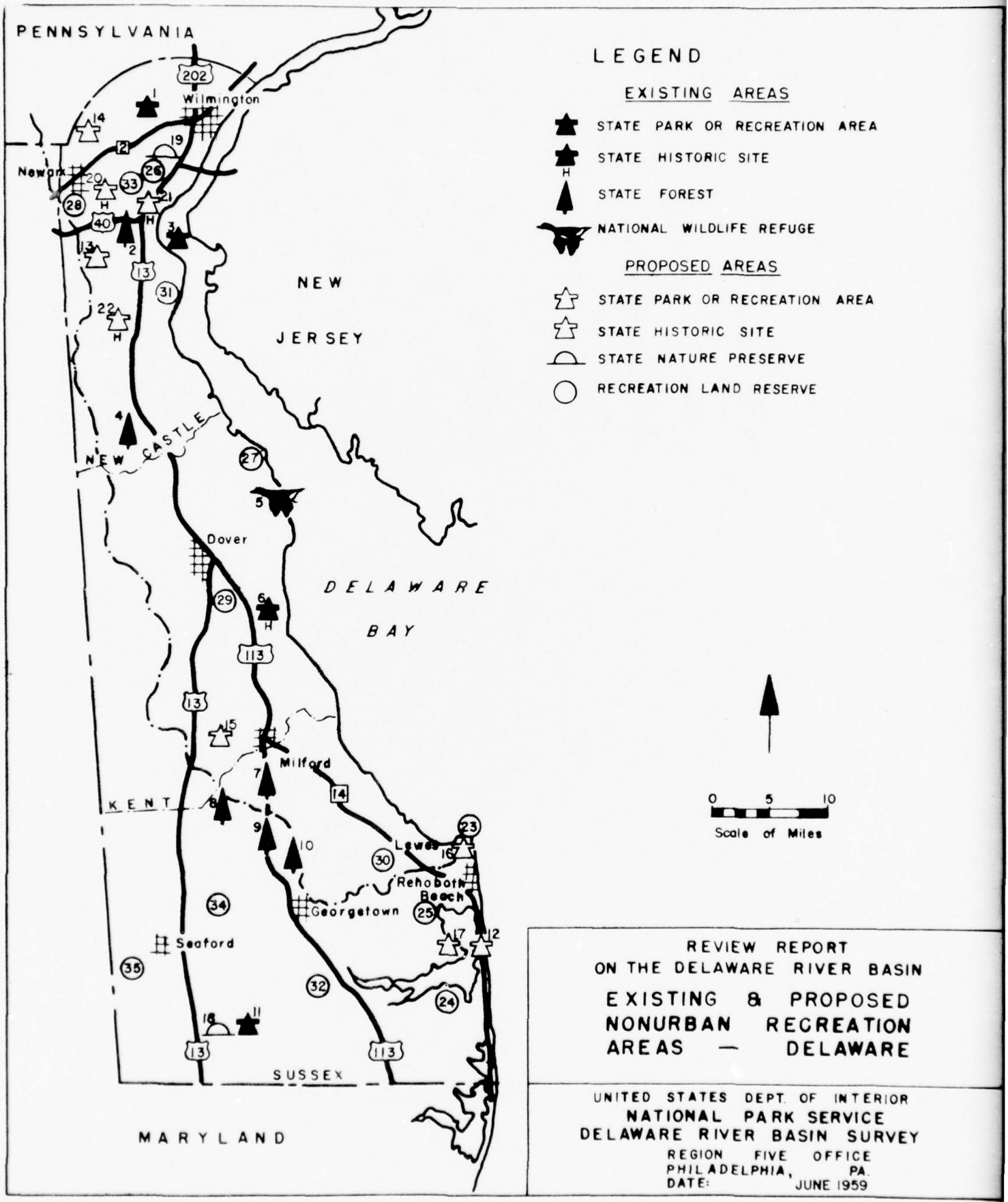
753. Collins Mill Pond located midway between Georgetown and Bridgeville, is in private ownership and closed to public use. Some cottage development occurs on one arm of the impoundment; however, the greater portion is undeveloped. The shoreline is well-wooded and excellent condition prevail for the development of a State park or recreation area.

Nanticoke River (Sussex County)

754. The Nanticoke River and its principal tributary, Broad Creek, constitute an area of significant scenic beauty in the State. The broad expanse of the river with its extensive beds of water lilies and spatterdock, and forest-lined banks, is reminiscent of rivers of more southern climes and is unlike other rivers of the State. The river presents excellent opportunities for boating in

scenic surroundings from Seaford into Maryland and Chesapeake Bay.

755. The preservation of this scenic river by public acquisition and/or scenic easement of shorelands would insure the perpetuation of this rather unique setting. The acquisition and development of one or more sites for the recreation use of the public should be a part of this over-all program.



REVIEW REPORT
ON THE DELAWARE RIVER BASIN

EXISTING & PROPOSED NONURBAN RECREATION AREAS — DELAWARE

UNITED STATES DEPT. OF INTERIOR
NATIONAL PARK SERVICE
DELAWARE RIVER BASIN SURVEY
REGION FIVE OFFICE
PHILADELPHIA, PA.
DATE: JUNE 1959

PLATE 22

LEGEND

EXISTING AREAS

- STATE PARK OR RECREATION AREA
- STATE HISTORIC SITE
- STATE FOREST
- NATIONAL WILDLIFE REFUGE

PROPOSED AREAS

- STATE PARK OR RECREATION AREA
- STATE HISTORIC SITE
- STATE NATURE PRESERVE
- RECREATION LAND RESERVE



REVIEW REPORT
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EXISTING NONURBAN RECREATION AREAS

1 Brandywine Springs State Park
2 Red Lion State Forest
3 Fort Delaware State Park
4 Blackbird State Forest
5 Bombay Hook National Wildlife Refuge
6 John Dickinson Mansion State Historic Site
7 Appenzellar State Forest
8 Owens State Forest
9 Ellendale State Forest
10 Redden State Forest
11 Trap Pond State Park

PROPOSED NONURBAN RECREATION AREAS

12 Delaware Seashore
13 Lums Pond
14 Mason-Dixon Interstate
15 Killen-Coursey-McCauley Ponds
16 Delaware Dunes
17 Long Neck
18 Trussem Pond
19 Churchman's Marsh
20 Cooch's Bridge
21 Buena Vista
22 Commodore Macdonough House

RECREATION LAND RESERVES

23 Cape Henlopen (Fort Miles Military Reservation)
24 South Shore of Indian River Bay
25 West Shore at Rehoboth Bay
26 Proposed Christiana Reservoir Project
27 Woodland Beach
28 Becks Pond and Sunset Lake
29 Voshell Pond
30 Red Mill Pond
31 Augustine Beach
32 Ingrams Pond
33 Smalley's Pond
34 Collins Mill Pond
35 Nanticoke River

NONURBAN RECREATION PLAN - NEW JERSEY (See Plate 28, following page 192)

756. The studies and investigation conducted in the New Jersey portion of the Delaware River Basin and the coastal area of the State constitute the basis upon which this plan was developed. The entire State can be divided roughly into four major problem areas with regard to nonurban recreation opportunities: (1) The Northeastern Metropolitan Region; (2) The Trenton Metropolitan Area; (3) The Camden Metropolitan Area; and (4) The Seashore and Coastal Region.

757. The Northeastern Metropolitan Region of the State is not included in the study area; however, the problems of this region have a definite influence on the nonurban recreation resources of the Basin. An overwhelming majority of the visitors to recreation areas in the Basin portion of the State originate in this metropolitan complex. The three most significant factors contributing to this influx of non-Basin residents are the relatively short travel distance involved; the lack of adequate nonurban recreation space and facilities close-to-home; and the general attractiveness of this section of the State for urban dwellers. On the basis of the best available information it appears quite clearly that the nonurban recreation problem of Metropolitan Northeastern New Jersey will continue to extend from the Hudson River to the Delaware River, and that increasing demands will be placed upon existing nonurban recreation areas and all available recreation resources.

758. Existing nonurban recreation spaces and facilities in Norther New Jersey including the Basin portion of the State are inadequate to absorb the visitor impact from the metropolitan northeastern section. In many instances available recreation space is grossly too small to accommodate the visitor load. For example, 10,000 to 12,000 day-use visitors crowd into the 107 land acres of Hopatcong State Park, much of which is too rough for intensive recreation purposes. Other areas such as Stokes and Jenny Jump State Forest are "water poor". Basically, the problem becomes one of obtaining a balance between recreation water and usable land. To accomplish this end, it will be necessary to acquire private inholdings containing potential recreation water, the acquisition of recreation water adjacent to existing nonurban recreation areas, develop recreation water in existing areas, expand existing areas to include more usable land, and the development of new sites on a more extensive scale than has been done in the past.

759. The nonurban recreation problems of the Trenton and Camden Metropolitan Areas are somewhat similar in that both regions are deficient in space and facilities close-to-home for less than full day outings. Camden County has operated a system of parks for many years and though chiefly urban in character they have provided open space, picnic, and play facilities. Mercer County in which Trenton is located, organized a recreation department in 1958 and has plans for the development of three parks. In view of the concentrations of population in the Trenton and Camden Metropolitan Areas consideration should be given to establishing metropolitan or regional park agencies for the

acquisition, development, maintenance, and operation of park systems in these regions. These parks should be essentially nonurban in character and designed to fill the void between city parks and State parks and forests.

760. On the basis of acreage to population, the present State-owned nonurban recreation lands in the southern portion of the State, if adequately developed and expanded to include available recreation resources, should serve the nonurban recreation needs of the population of Southern New Jersey, including Trenton and Camden Metropolitan Areas until approximately 2010. These areas should be developed for all types of day-outings as well as for weekend, and vacation purposes. In this regard, particular reference is made to the nonurban recreation potential of the Wharton Tract and the State forests surrounding this vast wilderness area in fulfilling nonurban recreation needs in the southern half of the State.

761. There are three basic problems with regard to the New Jersey seashore. First, the most urgent concern is free public access. Secondly, is the need for seashore parks and third, is the need for reclamation of much of the northern seashore area.

762. The 128 miles of seashore, coastal bays, islands, waterways, and marshes extending from Sandy Hook to Cape May is perhaps the most valuable of the State's recreation resources. To date (1959) the great attraction has been the seashore strand itself with little attention paid to the coastal bays and islands. The New Jersey State Planning Board in describing the situation in 1941, (50) reported:

> "Generations of unregulated private development and exploitation of the shore, more recently facilitated by the automobile, have absorbed all but a very few miles of the better beaches. Much of the occupied ocean front is privately-owned and closed to the public. Restrictions have been placed upon the use of so many of the so-called public beaches either to prevent overcrowding or to favor a particular clientele. Free public use of New Jersey's beaches is now virtually a thing of the past and may be partially restored only by the State or by the Federal Government through the development of public seashore parks".

763. This description is even more appropriate today (1959) than when it was written in 1941.

764. "New Jersey holds its seacoast in trust for all the nearby hinterland and to some extent for the rest of the country".(50) The most urgent problem facing the State is the emancipation of the shore. Free public access to the area between the strandline (the maximum distance inland from the surf at which debris is deposited by tides, waves, storms or a combination of the three) and the surf, should be an

unalienable right of the public guaranteed by the State. The eventual ownership of this area should be a long range objective. In addition, routes of ingress and egress and parking facilities will have to be provided. More rigid control over seashore real estate developments adjacent to the strandline could eliminate public access problems entirely.

765. Along the 128 miles of ocean front, there are two State Parks, Island Beach and Barnegat Lighthouse. Efforts are being made to preserve two-thirds of Island Beach's 2,200 acres in a natural undeveloped state, while the center one-third will be developed for day-use purposes. Twelve-acre Barnegat Lighthouse is an historic site. Other large sections of undeveloped beach are not available; however, small tracts are still obtainable and sparsely developed sections could be easily converted to public seashore parks.

766. It is recommended that all remaining undeveloped or sparsely developed beaches regardless of size be acquired by the State for public seashore parks.

767. The "unregulated" private development and exploitation of the shore as described above has resulted in ocean front slums in many areas in the northern one-third of the State's seacoast. This is the section that is most in need of reclamation and redevelopment. It would appear that the only solution will be found in a bold plan similar to urban renewal projects of large cities. The objective of such a project should be the reclaiming and redevelopment of the State's beachlands for public benefit.

768. The great recreation values of the coastal bays and associated marshes and shorelands have been overshadowed by the appeal of the ocean beaches. With continued crowding on these beaches it seems reasonable to assume that the inland bays will soon be recognized for their true recreation values. Encroachments by real estate developers and industrial interests have already begun. For a relatively short time, the State will be able to select those sites that are potentially most beneficial for public recreation.

PHASE ONE

769. This phase includes the improvement of existing areas, the completion of project areas, the acquisition and development of new sites, and the acquisition of recreation land reserves for deferred development.

IMPROVEMENT OF EXISTING AREAS

770. The existing nonurban recreation areas in the Basin portion and included study area of New Jersey are inadequate in size and facilities to absorb the great impact of visitors placed upon these areas. In some instances the visitor load far exceeds the capacity of the area or the facilities. It is not uncommon to have a daily visitor load that is twice the design load of the facilities. Efforts to accommodate an ever

increasing demand on areas that are already too small, have resulted in deterioration of the area as a whole. Other areas are inadequate in proportion to the available resource and usable land space.

771. The Department of Conservation and Economic Development is presently engaged in a program that includes the improvement of existing facilities and the installation of new capital improvements in an effort to better meet the pressures placed upon State-owned nonurban recreation areas. The improvement of sanitary facilities and water systems in all areas is an over-all objective to safeguard public health. The replacement of deteriorated facilities originally installed by the Civilian Conservation Corps is a major item of park maintenance. New capital improvements including bathhouses, beaches, camp and picnic areas, are being installed in many parks and forests.

772. The improvement of existing nonurban recreation areas and the development of all State-owned forests and park lands will not solve the need for space and facilities. Although many of the publicly-owned lands of the State are inadequately developed for nonurban recreation purposes, other tracts are overused and some do not possess the necessary potential to warrant development. The only reasonable solution will be found in an objective appraisal of the recreation resources now available on public lands and their coordinated development in accordance with a balanced master plan. The ultimate plan of use might very well indicate controlled use of some areas such as Hopatcong State Park or the sale or transfer of areas such as Mount Laurel, or Musconetcong State Parks. Of paramount importance is the determination of visitor capacity and the control of use to protect the resource.

Recommendations with regard to individual areas are as follows:

STATE PARKS

773. Allaire State Park: The outstanding public values at Allaire are associated with the historical iron making village. The stabilization, restoration, and interpretation of this site should take precedence over intensive day-use activities. The maintenance of the over-all rural village scenes should be the objective. Visitor facilities should be restricted to those necessary for the convenience and comfort of the historical sight-seer, such as parking areas, picnic tables, comfort stations, and related services.

774. Barnegat Lighthouse State Park: Improvements in this park should be concerned with the stabilization of the lighthouse to the extent that it would be safe for visitors and with the provision of interpretive services and devices to relate the history of the site.

775. Enlargement of the park area is essential in order to better accommodate day-use activities such as swimming and fishing which are compatible with the primary attraction of the area.

776. Cranberry Lake State Park (Undeveloped): The park and

recreation resources of this site are recommended for inclusion within the proposed Allamuchy Mountain Area.

777. Fort Mott State Park: The gun emplacements of the former military establishment are the primary attraction in the park. The possibility of replacing one or more of the former coast artillary pieces should be explored. Interpretive devices and services would enhance the visitors appreciation of these remains.

778. Although pollution in the Delaware River precludes swimming at the park's beach, this water resource could be used for recreation boating. It is recommended that a marina and boating facilities be provided to serve the needs for this activity.

779. High Point State Park: Numerous and varied improvements could be made in this area so that it would produce a more abundant return of enjoyment to the public. Since this is the largest and most significant of the State's inland parks, planned studies should be undertaken with a view to coordinating the development of the park as a unit. The over-all size of the park and availability of resources are such as to make possible the accommodation of a tremendous visitor load and still preserve the resource and maintain a proper environment.

780. Two specific recommendations are offered. (1) Inholdings of private property should be acquired and the boundary rounded-out. (2) Restore the natural aspects of High Point Mountain north of State Route 23 and preserve this section of the park for its outstanding scenic qualities. The present developments at Lake Marcia and Steenykill Lake are adequately screened to the point that these developments do not detract from the natural scenes.

781. Hopatcong State Park: The problem at Hopatcong is overuse and lack of space. Approximately 80 acres of land could be added at considerable cost. This would provide space for much needed picnic areas and parking lots and would temporarily relieve overcrowding. The only permanent solution to overuse will be found in controlled access to the park.

782. Island Beach State Park: This park now has one bathhouse and an 800 car parking lot. Small parking spaces have been provided along the road. This 2,200-acre seashore park poses several possibilities for public use. The most reasonable plan of development seems to be a compromise between those who favor the preservation of the entire tract as a natural seashore and those who would like to see it developed for intensive day-use recreation. Present development plans provide for the preservation of the north one-third and south one-third in their natural state with the middle one-third developed for day use activities.

783. Mount Laurel State Park (Undeveloped): The resources of this site would not warrant its development as a State park. It is

recommended that this area be transferred to Burlington County for park and recreation purposes.

784. Musconetcong State Park: The resources of this area are insufficient for a State park development. Inasmuch as it serves only local needs, it is recommended that the area be transferred to the adjacent boroughs for administration.

785. Parvin State Park: The only improvements recommended for Parvin are additional family unit campsites and the construction of an organized group camp on the site of an abandoned Civilian Conservation Corps Camp.

786. Princeton Battlefield State Park: Improvements in this area should be concerned with the interpretation of the historical significance of the Battle of Princeton through an improved system of signs and devices. The "Clark House" where General Hugh Mercer died during the battle should be converted to a visitor center and museum.

787. Stephens State Park: It is recommended that this park be included within the proposed Allamuchy Mountain Area.

788. Swartswood State Park: Efforts should be made to disperse present activities over a wider area to reduce the concentration of visitors. This could be accomplished by the development of a second beach or the expansion of the present beach and the development of an additional picnic area. Overnight camping facilities could be provided.

789. Voorhees State Park: The resources of this area are inadequate to meet State park needs. It is recommended that this area be transferred to Hunterdon County for administration as a county park.

790. Washington Crossing State Park: It is recommended that greater emphasis be given to the historical values of this area through an improved interpretive system and that other day-use activities should be held to a minimum.

STATE FORESTS

791. Bass River State Forest: The recreation potential of this forest is considerable and with planned development and inclusion of additional tracts it could be made to afford substantial nonurban recreation opportunities. The land surrounding Lake Absegami Recreation Area is such that it could support a wide variety of activities in addition to its present use for picnics, swimming, and vacation cottages. A 60-unit campground is being installed as a first step in providing additional facilities. Consideration should be given to organized group camps for public and quasi-public organizations.

792. It is recommended that present holdings be consolidated

into a contiguous unit with special attention given to the inclusion of streams and water areas. The addition of the lower portions of Bass and Wading Rivers would be of particular recreation value.

793. Belleplain State Forest: Belleplain offers excellent opportunities for development into a significant nonurban recreation area. Good usable space is available at the Lake Nummy Recreation Area for the further development of this site for increased day-use purposes. East Creek Lake is an excellent site for family and group camping. Inasmuch as Lake Nummy is now developed for day-use purposes, it is recommended that East Creek Lake be reserved, at least for the present, for camping and fishing.

794. Consolidation of present holdings into a solid block would be highly desirable. Every possible effort should be made to include the several lakes and ponds near the present forest boundary.

795. Green Bank State Forest: The Mullica River possesses a multitude of recreation possibilities that are being recognized and acquired for private use. It is recommended that forest lands be consolidated and expanded to include lands on both sides of Mullica River and that this particular area be developed for recreation.

796. Jackson State Forest: This is an experimental forest of 45 acres and is not recommended for recreation use.

797. Jenny Jump State Forest: The absence of recreation water is the deterrent to the development of this forest for extensive recreation. Expansion of present State-owned lands to include Beaver Brook and Trout Brook would provide limited recreation water and the possibility for the creation of an impoundment for recreation use.

798. Lebanon State Forest: The vast recreation potential of this forest will not be realized until recreation water areas are added. This might be accomplished by enlarging the two existing small ponds or by the construction of sizable impoundments preferably in the western portion of the forest.

799. Real estate speculation on the inholding south of State Route 70 may preclude the acquisition of this tract, however, this should be a long range objective in event that real estate ventures prove unprofitable. A lake has been developed in this area.

800. Penn State Forest: It is recommended that forest lands be extended to surround Oswego Lake and include Oswego River. The remoteness of this forest suggest that it would be particularly adaptable for extensive forms of nonurban recreation such as organized group camping for public and quasi-public organizations in the South New Jersey region.

801. Stokes State Forest: Stokes is the most intensively developed and heavily used of the State's forests. However, the full potential of the forest for recreation will not be realized until additional recreation water is made available. The acquisition of private inholdings, including lakes and lakes adjacent to the forest boundary would provide the much needed water areas. It would be possible to create impoundments on forest lands and this would be more economical than acquiring private developments surrounding existing lakes not on forest land.

802. It is recommended that forest holdings be consolidated through the gradual acquistion of private inholdings and that the boundary be rounded out to form a more manageable unit.

FOREST PARK RESERVATION

803. Wharton Tract: The final development plan for the 96,000 acres of the Wharton Tract has not been completed but present indications are that nonurban recreation will be a principal use of the area. The over-all recreation potential is outstanding and is further enhanced by its proximity to the Camden urban region.

804. It is recommended that a master plan be prepared for the coordinated development of the area to provide for a wide variety of nonurban recreation activities. Sites in the western portion should be developed for day-use and areas in the eastern section should be reserved for weekend and vacation purposes. Sites deep in the interior should be preserved in a natural condition for primitive camping, nature study, canoeing and more rugged use.

805. Worthington Tract: This 6,200-acre tract is essentially a primitive area where an excellent opportunity exists for the development of a well-balanced multiple-purpose nonurban recreation area. To accomplish this end, a carefully thought out master plan is a prerequisite to development. The resources are varied and adequate to afford recreation opportunities to a great number of visitors for multiple-purposes.

PUBLIC HUNTING AND FISHING GROUNDS

806. The Division of Fish and Game is currently working with other Divisions within the Department of Conservation and Economic Development in the planning for greater utilization of fish and game areas for swimming, camping, picnicking, etc., where such activities would not interfere with the primary purpose for which the areas were acquired. One of the objectives is to have the Bureau of Recreation take over the management of those recreation activities not related to hunting and fishing.

807. The improvement of fishing and hunting opportunities in New Jersey is a continuing program of the Division of Fish and Game. Present plans include the construction of 10 or more water impoundments in fresh and salt water regions, the construction of three

boat launching ramps, the development of uplands on three existing fish and game areas, the acquisition of additional acreage to round out present holdings, and the creation of new areas.

808. The provision of public access to lakes and streams is an important effort. The Division contemplates the acquisition of access areas and the construction of boat launching ramps and parking facilities on those streams and lakes which are either tidal and thereby open to the public in perpetuity or are inland waters to which the public has the right to usage under existing State statutes. The right of the public to use many of the inland waters of the State is not clear and this particular problem is being given special attention.

HISTORIC SITES

809. The adequate interpretation of New Jersey's historic sites and State parks of historical significance is a matter of importance. The possibilities for popular education relative to the meaning of each area have not been exhausted. The adequate interpretation of these areas would greatly enhance the visitor's enjoyment and understanding of the areas selected for preservation by the State. Interpretive devices such as museums, trailside exhibits, lectures, tours, and appropriate signs might be employed effectively to enrich the visit of the traveler.

MISCELLANEOUS

810. Delaware and Raritan Canal: This is one of the few remaining relics of the canal era. This State-owned property includes 354 acres of contiguous lands in addition to the canal right-of-way. A portion of the canal has been abandoned; however, the remaining 59 miles extending from Raven Rock on the Delaware River to New Brunswick via Trenton is still intact.

811. This water way has definite scenic, historic, and recreational values and could be made to serve quite significant over-all recreation purposes. Possible activities would include fishing, swimming, canoeing, picnicking, hiking, sightseeing, etc.

PROJECT AREAS

812. The New Jersey Department of Conservation and Economic Development through its Division of Water Policy and Supply is responsible for carrying out the provisions of the "New Jersey Water Supply Law of 1958" and companion "Water Bond Act" for the construction of two major water storage facilities on the South Branch of the Raritan River (outside the drainage of the Delaware River but within the included study area of a Basin County). The program provides that each project will be financed by a bond issue and that the facility will be entirely self-supporting and self-liquidating within the period of the bond issue. The statute assures that each storage facility developed and operated by the State will provide, through multiple-use of waters impounded, additional benefits of definite and lasting value besides a new supply of water for homes, farms, and industry.

813. In the past, recreation has been entirely neglected or relegated to a minor role. Therefore, in recognition of the ever increasing need for additional recreation facilities, and the tremendous value of water areas, swimming, boating, fishing, and other recreational activities compatible with water requirements will be permitted on all reservoirs developed by the State.(53) This policy if adequately implemented, could be of tremendous significance in fulfilling recreation needs of the State. It is therefore recommended that recreation use of reservoirs and adjacent lands be included in the initial planning stages and that adequate lands be acquired specifically for recreation above the normal flood elevation. the cost of these lands, their development, administration, maintenance and policing should be a function of the State park organization. This could be accomplished with no effect on water rates.

814. Present financing arrangements do not include the acquisition of lands specifically for recreation since these costs would have to be passed on to the water consumer in the form of a higher water rate. However, some lands above the normal flood stage of the project reservoirs have been acquired in consideration of existing property lines, logical control points, etc. These areas, where appropriate, will be available for recreation use.

815. Spruce Run Reservoir: The Spruce Run Reservoir will have a surface area of 1,290 acres and a relatively constant water level at an elevation of 273 feet. The shoreline will be irregular with numerous large and small bays and necks of water extending up the tributary streams. The water quality is adequate for all appropriate water recreation activities.

816. The topography of the surrounding land is excellent for the accommodation of large visitor loads. Musconetcong Mountain, north of the reservoir, adds variety and suggests camping activity for family and group purposes. For the most part, the entire shoreline will be usable for intensive day-use purposes.

817. The potential of this proposed reservoir in meeting nonurban recreation needs will be outstanding. Every effort should be exerted to acquire additional lands as required to guarantee for public benefit the availability of this recreation resource.

818. Round Valley Reservoir: The surface area of this reservoir will be 2,350 acres at full pool; however, considerable flucuations will occur, thus diminishing the recreation potential. The recreation use of this impoundment will be permitted and encouraged but in spite of the gross area of the reservoir, the net gain for nonurban recreation will of necessity be small. Basic minimum recreation facilities will be provided.

PROPOSED NEW DEVELOPMENTS

819. The following proposed new developments are recommended for addition to the State park system. The order of arrangement in the plan indicates the recommended priority.

WAWAYANDA LAKE (Sussex County)

Location Wawayanda Lake is located 33 miles northwest of Newark, the heart of New Jersey's greatest population concentration. Considering the Greater New York City area, more than 10 million people reside within day-use driving distance of this site. State Route 23 and County Route 515 provide access to the area.

Recreation Resources The Wawayanda Lake Area possesses outstanding nonurban recreation resources and potential for the development of a State park or recreation area of great value to the metropolitan region of Northeastern New Jersey. Included within the area are Wawayanda Lake (225 acres), Barry Lakes (2), Lake Lookout, Laurel Pond, several small unnamed ponds, numerous streams, marshes, promontories above 1,300 feet, panoramic views, scenic gorges, wildlife, and a good forest covers over 98 percent of the area. The most significant aspect of this area is that it is virtually free of developments and available for acquisition.

Wawayanda Lake is a relatively large attractive body of water situated in an extremely pleasing environment. The shoreline is irregular and contains many bays and points. Several islands interrupt the surface expanse and add interesting variety and the illusion of greater area. The wooded shores present a wilderness



Wawayanda Lake - Available and undeveloped

appearance seldom found around other lakes in the State.

The general topography of the region is a rolling plateau broken by low hills and gentle slopes. The maximum elevation is in excess of 1,300 feet. The irregularity of the terrain provides added interest and suggest numerous development possibilities. The over-all characteristics of the region are well suited to nonurban recreation activities.

The region is approximately 98 percent forested providing an excellent setting for all appropriate nonurban recreation activities.

As an extra added feature, a good lake site exists where an impoundment of approximately 400 acres could be created. This would provide an additional recreation water area for development at a later date.

Recommended Purpose and Uses	It is recommended that the Wawayanda Lake region be acquired at the earliest possible date for development as a State park or recreation area. The resources are more than adequate to provide ample opportunities for all appropriate nonurban recreation activities such as camping, picnicking, swimming, boating, fishing, riding, hiking, organized camps, sightseeing, nature study, etc.
Estimated Annual Visitation	2,000,000
Acreage Requirement	10,000 acres
Cost of Physical Improvements	$12,000,000

ALLAMUCHY MOUNTAIN AREA (Warren and Morris Counties)
Proposed Hackettstown Reservoir Project

Location — This site is located near the heart of the northwest New Jersey vacation region, 34 miles and 43 miles northwest of Newark and New York City respectively. More than 10 million people reside within day-use driving distance of this area.

U.S. Route 46 and State Route 10 provide access to the area from the metropolitan region of Greater New York City and various U.S. and State routes serve the area from other directions. Proposed Interstate Route 80 will provide direct access from east and west and will reduce the travel time from Times Square to approximately one hour.

Recreation Resources — The over-all characteristics of this area make it particularly adaptable for a wide variety of nonurban recreation purposes. Of special significance will be the 1,200 acres of recreation water created by the proposed damming of the Musconetcong River in the vicinity of Saxton Falls. Although the State owns numerous lakes in the region, publicly-owned land fronting on these lakes are virtually nil. This reservoir will be 6 miles long and will have approximately 20 miles of irregular shoreline containing numerous points, bays, and necks. The water quality of the Musconetcong River is good and is suitable for all appropriate forms of water recreation.

The topography surrounding the proposed reservoir is varied and interesting. Hills and ridges rise to an average elevation of 1,000 feet to form a glaciated, boulder strewn, rolling plateau. Steep hillsides along the northwest shore would form a scenic backdrop opposite day-use areas located on the gentle slopes of the southeast shore. Numerous small streams and scenic stream courses interlace the interior of the tract.

Approximately 90 percent of the area is forested with mixed hardwoods, hemlocks, rhododendron, and laurel. The general quality of the forest cover is good and provides excellent cover for wildlife.

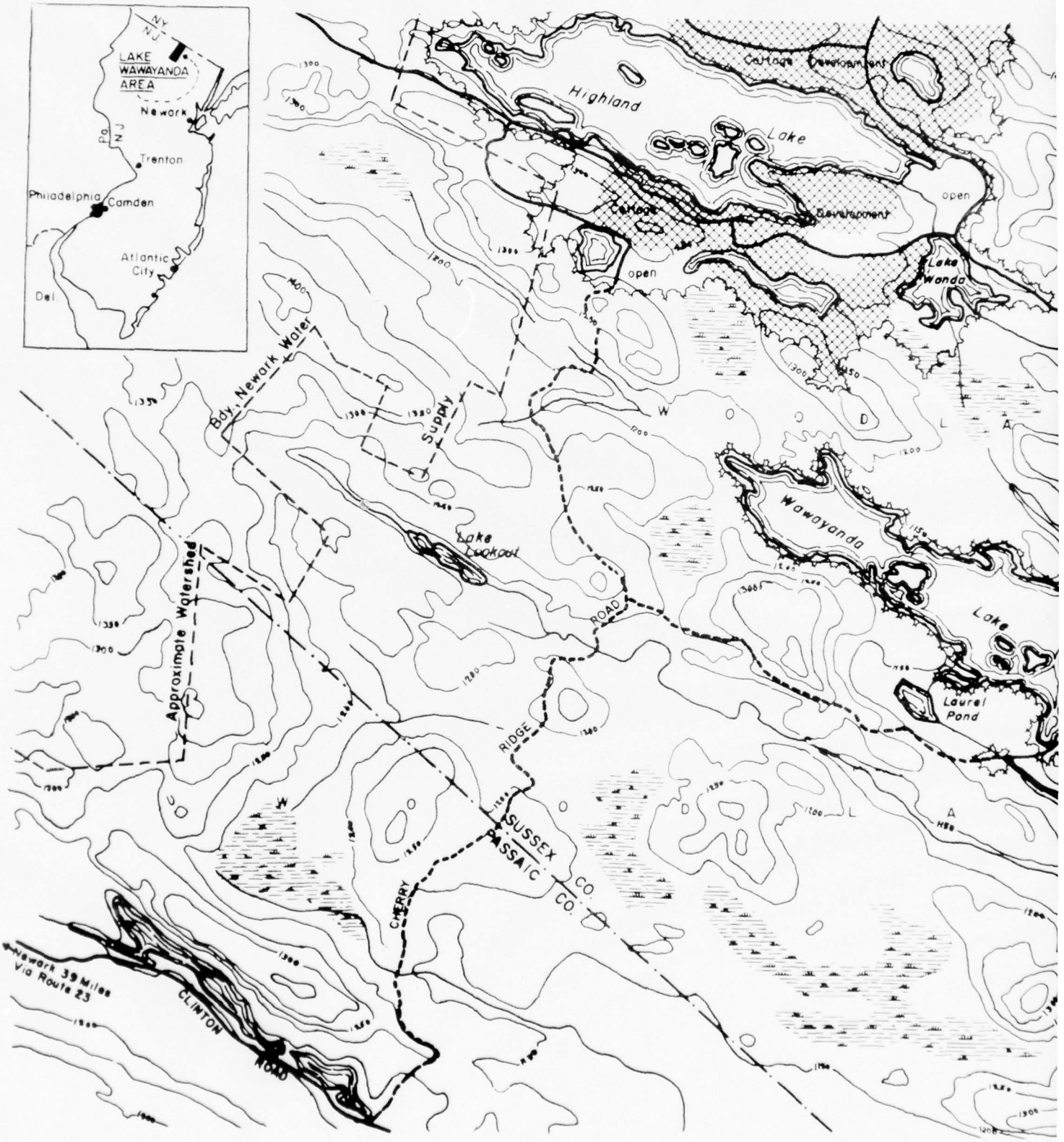
Included within the area are several small lakes and ponds and a section of the old Morris Canal. Some of these lakes have been developed as private cottage clubs to the exclusion of the general public. These lakes if acquired could serve a great number of recreationists as centers for family and organized camps. The old Morris Canal provides an aspect of historical interest.

Recommended Purpose and Uses — It is recommended that the Allamuchy Mountain Area be preserved and developed as a multiple-purpose State park and recreation area. Since this area lies between Stephens and Cranberry Lake State Parks, these areas should be included to form a single management unit.

The total recreation resources available in this combined unit would provide outstanding nonurban recreation opportunities. The character of the area is such that facilities for every conceivable type of nonurban recreation could be included in the development plan.

Estimated Annual Visitation	2,000,000
Acreage Requirement	$10,000*
Cost of Physical Improvements	$12,000,000

* Includes reservoir


NY
NJ
LAKE
WAWAYANDA
AREA
Newark
Trenton
Philadelphia
Camden
Atlantic
City
Del
Highland
Lake
Cottage Development
open
Lake
Wanda
Bdy. Newark Water
Supply
Lake
Lookout
Approximate Watershed
Wawayanda
Lake
Laurel
Pond
ROAD
RIDGE
SUSSEX
PASSAIC
CO.
CO.
CHERRY
CLINTON
ROAD
Whitehouse 39 Miles
Via Route 23

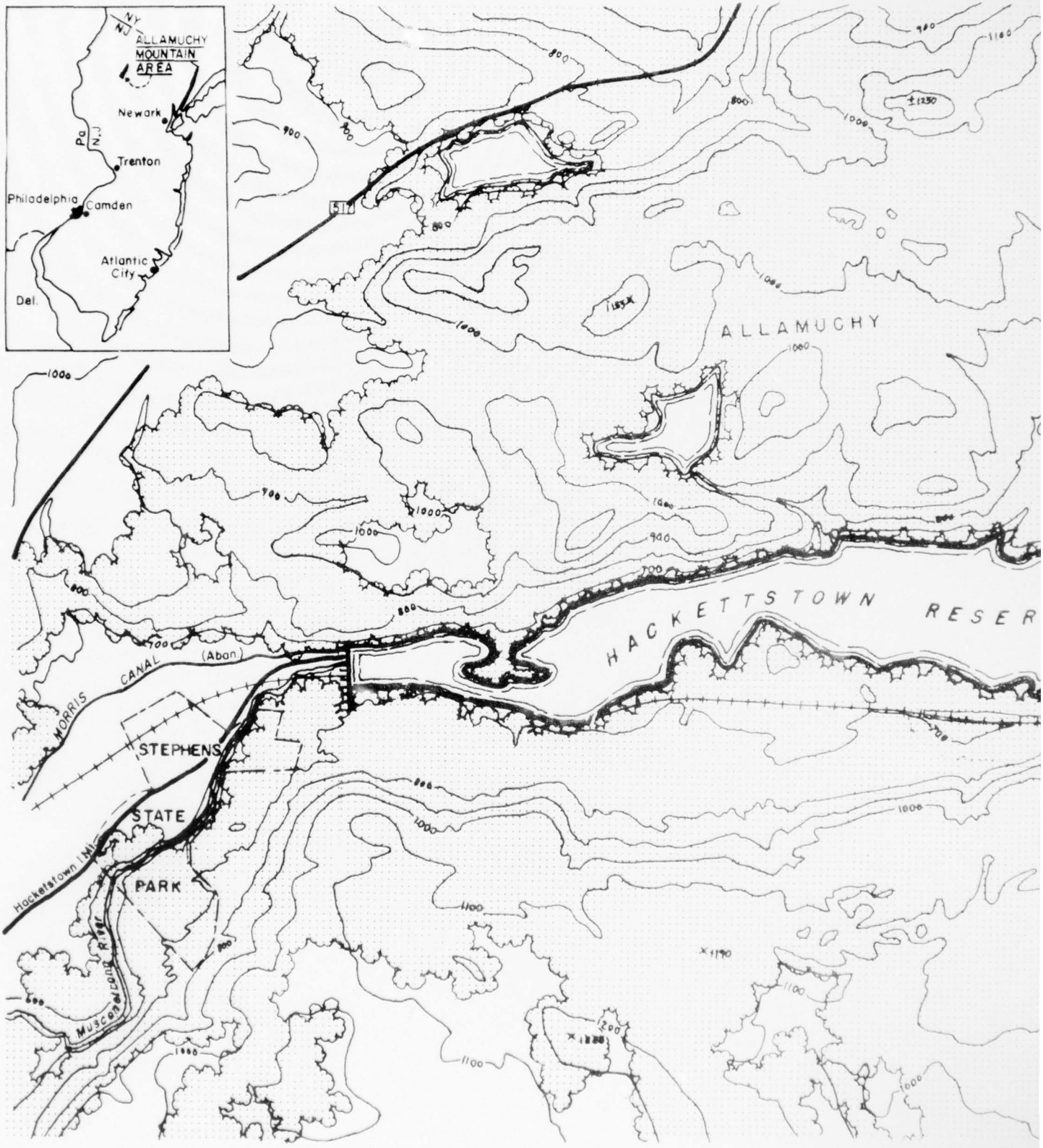


WAWAYANDA LAKE AREA

0 1/4 1/2

Scale of Miles

PLATE 23


NY
NJ
ALLAMUCHY
MOUNTAIN
AREA
Newark
Pa.
N.J.
Trenton
Philadelphia
Camden
Atlantic
City
Del.
ALLAMUCHY
HACKETTSTOWN
RESER
MORRIS
CANAL
(Aban)
STEPHENS
STATE
PARK
Hackettstown
Musconetcong River
±1250
1185
1190
1220


MOUNTAIN
CRANBERRY LAKE STATE PARK
206
ERVOIR (PROPOSED)
MORRIS
CANAL
(Abandoned)
RUN
ALLAMUCHY MOUNTAIN AREA
0 1/4 1/2
Scale of Miles

PLATE 24

SEVEN MILE BEACH (Cape May County)

Location This site is located within the borough limits of Avalon and joins the north limits of the borough of Stone Harbor. Access is provided from the Garden State Parkway and U.S. Route 9.

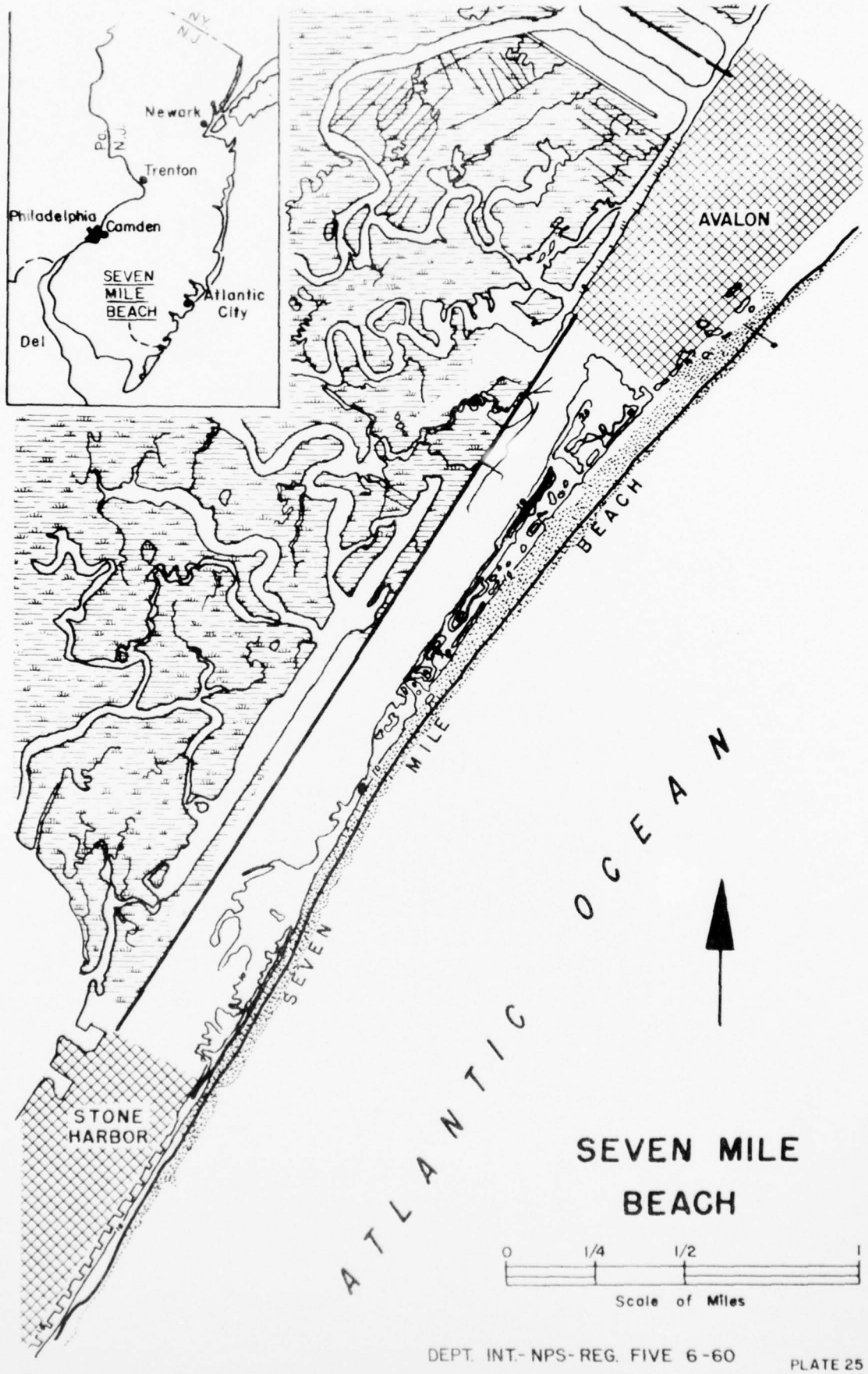
The site is favorably located with respect to the Wildwood vacation region but is somewhat removed from the principal population center of the Camden region. The 68 road miles from Camden would not necessarily constitute a deterrent to the use of this area for full day outing purposes.

Recreation Resources The principal recreation resource of this area is the undeveloped beach and the opportunity to develop a seashore park. There are 2-1/4 miles of sparsely to undeveloped beach, from 100 to 200 feet wide. The sand is clean but dark. The beach gradient is gentle and quite favorable for surf bathing. The dunes are numerous, and some reach a height of 25 feet. On the inland side, the dunes are covered with a dense growth of shrubs and small hardwoods. The area behind the dunes is level and readily adaptable for the placement of necessary improvements. This is the best remaining undeveloped beach south of Atlantic City.



Seven Mile Beach is one of the largest undeveloped beaches in New Jersey.

Recommended Purpose and Uses	It is recommended that the remaining undeveloped portion of Seven Mile Beach be preserved and developed as a seashore park for intensive day-use purposes.
Estimated Annual Visitation	1,500,000
Acreage Requirement	360 acres
Cost of Physical Improvement	$4,500,000



DEPT. INT.-NPS-REG. FIVE 6-60

PLATE 25

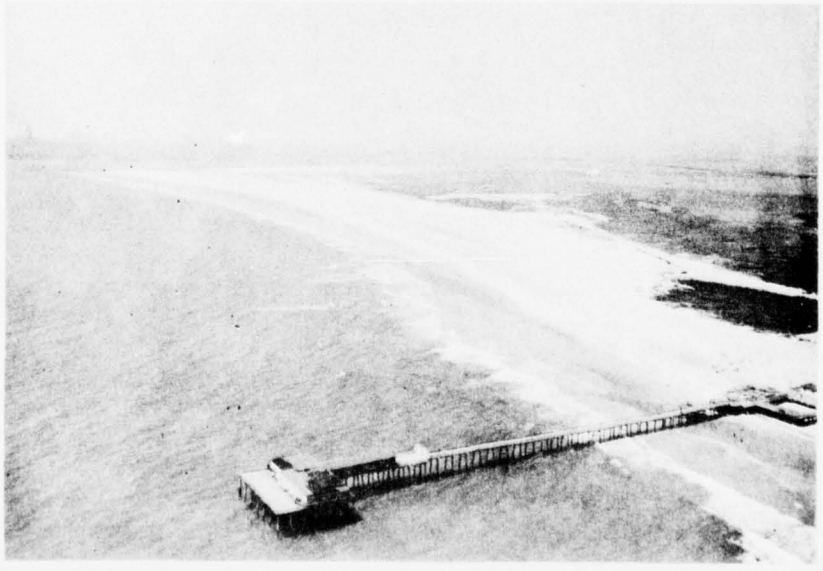
ABSECON INLET BEACH (Atlantic County)

Location This area is on the southern tip of Brigantine Beach directly across Absecon Inlet from Atlantic City. The site is accessible over State Route 87 from U.S. 30 and the Atlantic City resort area and is within day-use driving distance of the Philadelphia Metropolitan Area.

Recreation Resources The site contains about 600 acres of land and water and 1-1/4 miles of undeveloped beach. The beach is clean and wide but presently subject to rather severe erosion. A large portion of the tract is low and marshy and contains a landlocked lagoon.

In view of the extremely favorable location of this area, extensive improvements would be justifiable. The completion of the jetty at Absecon Inlet should arrest erosion and improve beach conditions. Dredging of the lagoon and filling of the surrounding marsh would create an ideal small boat marina and provide high ground for the placement of necessary day-use facilities such as bathhouse and parking space.

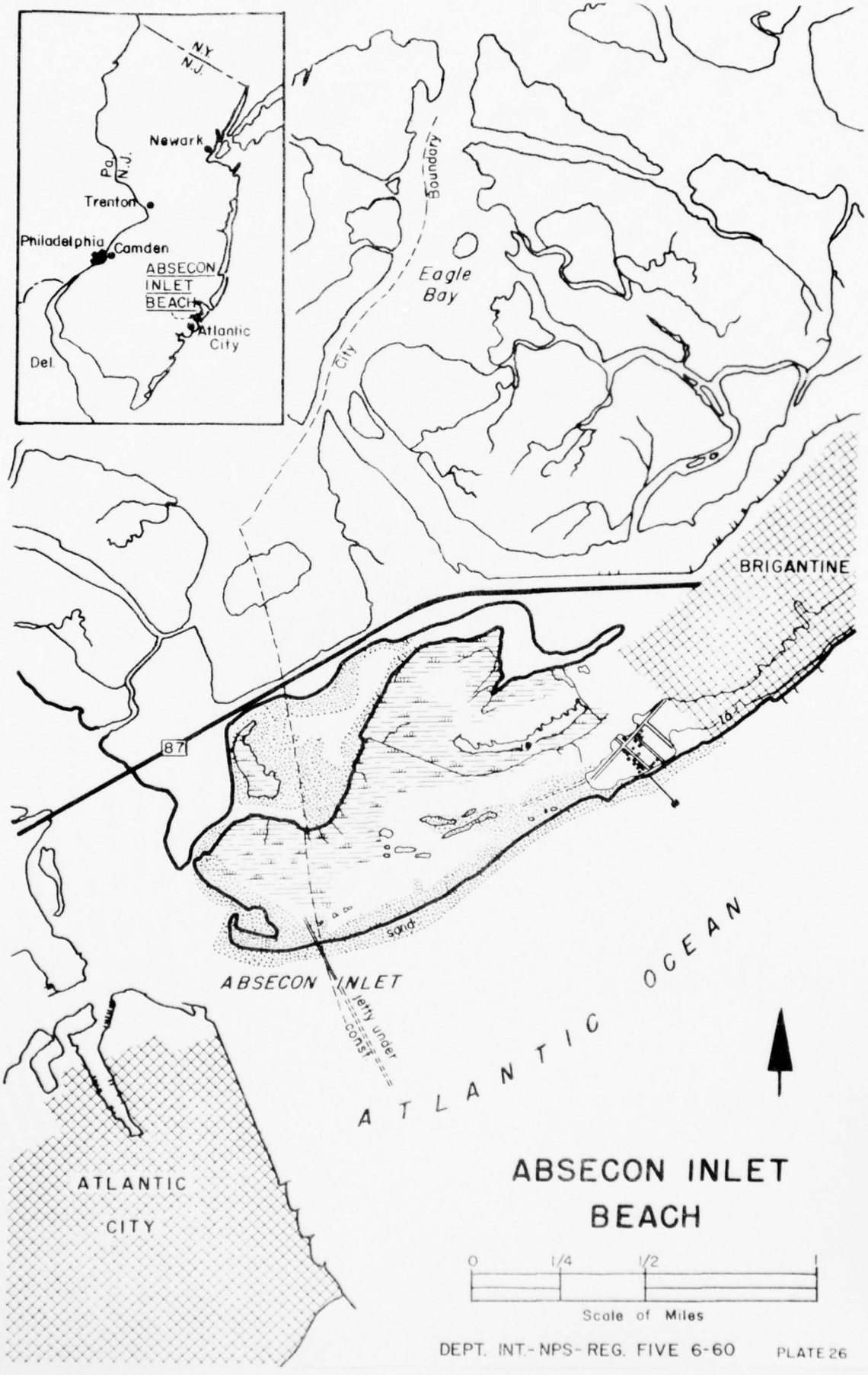
Recommended Purpose and Uses It is recommended that Absecon Inlet Beach be preserved and developed as a seashore park for day-use purposes. This type of park would provide seashore recreation



Absecon Inlet Beach across the inlet from Atlantic City.

opportunities in an environment free from the boardwalk atmosphere so common along the Jersey shore.

Estimated Annual Visitation	500,000
Acreage Requirement	600 acres
Cost of Physical Improvement	$1,500,000


NY
N.J.
Newark
Pa.
N.J.
Trenton
Philadelphia
Camden
ABSECON
INLET
BEACH
Atlantic
City
Del.
City
Boundary
Eagle
Bay
BRIGANTINE
87
sand
ABSECON INLET
jetty under
const
ATLANTIC OCEAN
ATLANTIC
CITY
ABSECON INLET
BEACH
0
1/4
1/2
1
Scale of Miles
DEPT. INT.-NPS-REG. FIVE 6-60
PLATE 26

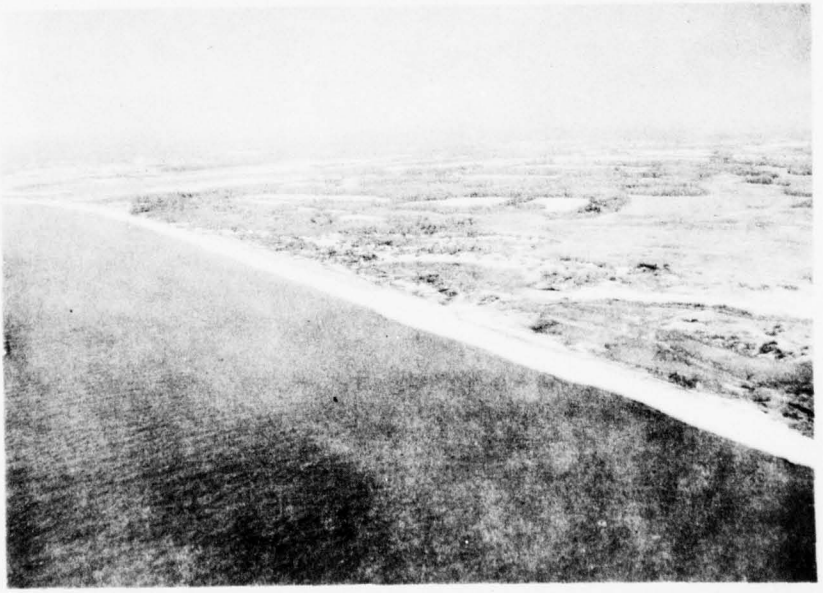
HIGBEE BEACH (Cape May County)

Location This area is located on the shore of Delaware Bay between Sunset Beach and the town of North Cape May. The site can be reached over improved roads from the Cape May area.

This site is favorably located with respect to the Cape May resort center and would provide an opportunity for vacationists to engage in a type of nonurban recreation, fast disappearing in the general area.

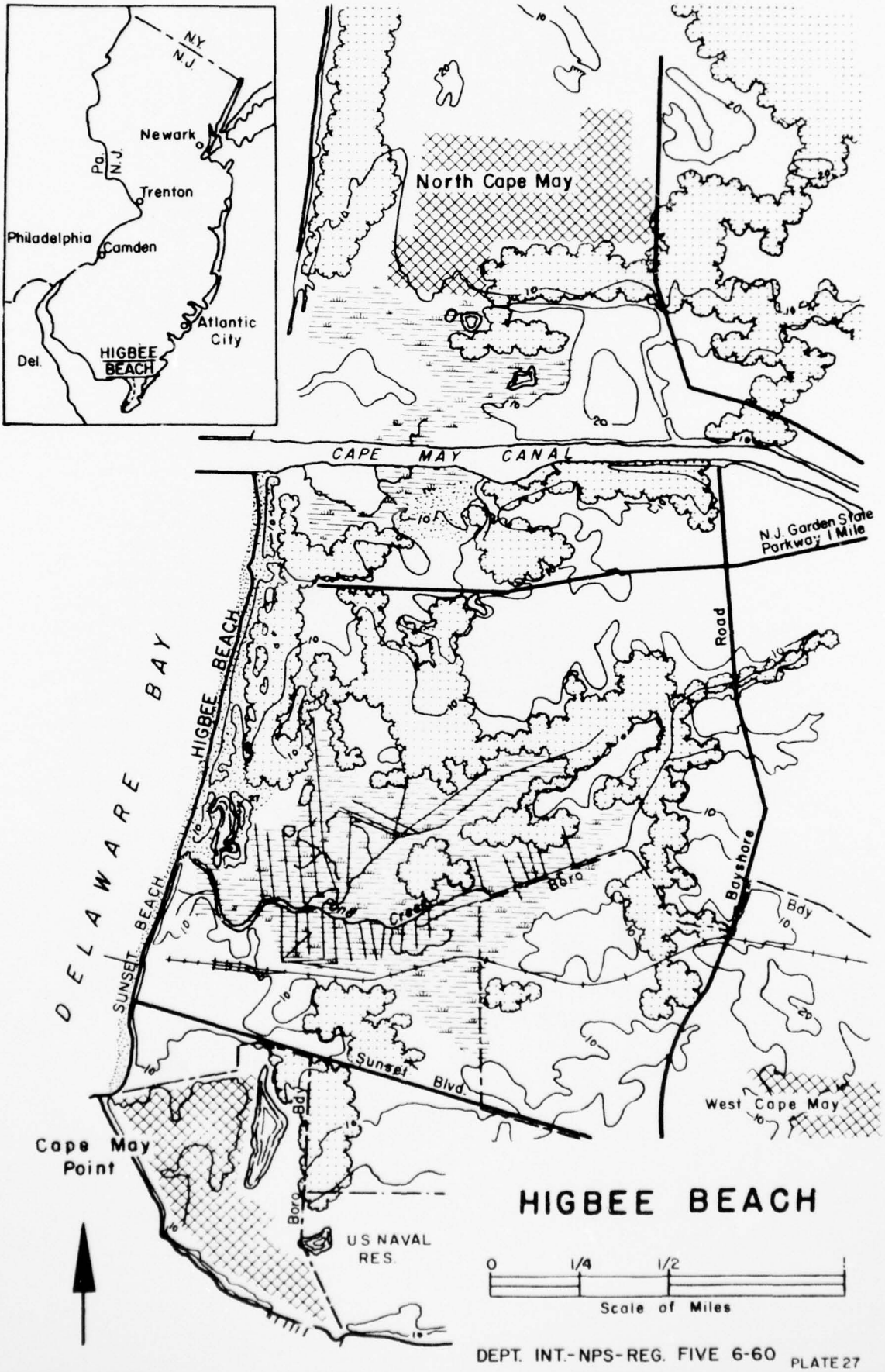
Recreation Resources This tract is somewhat unique for this section of New Jersey and contains aspects of biological interest. A large part of the area is upland, gently rolling, partly forested and partly farmed. The remaining portion is low and marshy, providing a favorable wildlife habitat. The forest consists of mixed stands of oak, holly, cedar, and pine. This tract has long been a mecca for birdwatchers because of the wide variety of birdlife.

The beach is narrow and the sand is dark but clean. The dunes are more like ridges and appear to be stable. The water quality at this point in the bay is good and suitable for swimming.



Higbee Beach and wildlife habitat north of Cape May.

Recommended Purpose and Uses	It is recommended that this site be preserved in its natural condition primarily for bird and wildlife purposes. Developments should be kept to a minimum in order to maintain the ecological communities and aesthetic values of this primitive area.
Estimated Annual Visitation	100,000
Acreage Requirement	1,600 acres
Cost of Physical Improvement	$200,000


NY
NJ
Newark
Pa.
N.J.
Trenton
Philadelphia
Camden
Atlantic City
Del.
HIGBEE BEACH
North Cape May
CAPE MAY CANAL
N.J. Garden State Parkway 1 Mile
DELAWARE BAY
HIGBEE BEACH
SUNSET BEACH
Road
Bayshore
Bbra
Bdy
Creek
Sunset Blvd
Bdg
West Cape May
Cape May Point
U.S. NAVAL RES.
HIGBEE BEACH
0 1/4 1/2
Scale of Miles
DEPT. INT.-NPS-REG. FIVE 6-60
PLATE 27

WAYSIDES

820. Roadside parks have gained wide public acceptance and popularity in recent years. They afford the traveler an opportunity to escape from the hurry of the highway for a brief period, and are places where he may rest, eat lunch, enjoy the natural scenery, then go on his way refreshed. Thus, they fill a three-fold purpose; they contribute to highway safety; they preserve scenic beauty; and they are convenient for those who wish to eat along the highway.

821. In general, roadside parks should range in size from one to five acres and should provide as minimum facilities, adequate parking space well off the highway, safe drinking water, comfort stations, picnic tables and refuse containers. The land comprising the park should be in addition to the normal highway right-of-way but contiguous to it.

822. It is recommended that a system of waysides be developed along scenic, historic or recreation tour routes that may be established for the benefit of recreation motoring as opposed to travel on high speed turnpikes, thruways, expressways, etc.

823. A layout for a typical roadside park appears in Plate 21.

MISCELLANEOUS

824. Delaware River Above Trenton: That portion of the Delaware River above Trenton is one of the most scenically outstanding features of the State and in addition is capable of providing a great measure of active recreation. Only a negligible amount of river frontage is owned by and accessible to the public. Boating, swimming, and fishing facilities are extremely limited. Less than half of the river front is approachable by improved highways.

825. The primary consideration in this section of the river should be the preservation of the scenic qualities. This might be accomplished through the acquisition of development rights, scenic easement or fee simple purchase of strategic sites.

826. Other desirable improvements would include access points for boating, canoeing, fishing, swimming and picnicking, the extension of the present river road (State Route 29) and the provision of overlooks and turnouts.

PHASE TWO

827. The following described recreation land reserves are recommended for acquisition as a part of PHASE ONE and held for development after 1980.

828. Paulina Reservoir Site (Proposed)(Warren County): The system of reservoirs proposed for the Delaware River Basin includes a dam in Paulins Kill, 1.5 miles east of Blairstown. This structure would create a long narrow impoundment of 1,650 acres. The shoreline would be extremely irregular with numerous bays, necks, and points.

829. The topography surrounding this site is steeply rolling and irregular as the result of glacial action. Moraines, kettle holes, and glacial ponds typify the general locality. The overall character of the site makes it readily adaptable for nonurban recreation uses.

830. Pequest Reservoir Site (Proposed) (Warren County): The system of water control structures proposed for the Delaware River Basin includes a dam in the Pequest River, 2.2 miles northeast of Oxford Furnace. This dam would create an impoundment of 1,400 surface acres.

831. The general setting of this proposed reservoir site is excellent for nonurban recreation purposes. The top of Mount Mohepinoke on the northwest shore would be 620 feet above the water line and would provide a desirable setting for scout activities. The southeast shores rise more gently and is well situated for intensive day-use purposes. The general area surrounding the proposed reservoir is intermittently open and wooded.

832. New Hampton Reservoir Site (Proposed)(Warren County): The New Hampton Reservoir site is included in the system of water control structures proposed for the Delaware River Basin. A dam in the Musconetcong River, 2.8 miles southeast of Washington, would create an impoundment of 1,800 acres in a setting highly suitable for intensive day-use and to a lesser degree for extensive recreation purposes.

833. The reservoir will be long and relatively narrow and would have a large bay extending northwesterly from the main body. The shoreline will be fairly regular but with sufficient irregularity to provide interest.

834. The northwest shore is ideally situated for the placement of day-use facilities to accommodate large visitor loads. The southeast shore rises steeply and is well-forested, thus providing an interesting backdrop for day-use areas on the opposite shore.

835. Conaskonk Point (Monmouth County): This 267-acre tract is adjacent to the community of Union Beach and thrusts northwardly into Raritan Bay. The land is low, marshy and subject to partial tidal inundation. The beach is about 8,000 feet long and narrow. There are no sand dunes nor shrub or forest communities and the

water appears to carry some pollution.

836. This is open space in close proximity to the most densely populated section of the United States and should be preserved for eventual development as a park and recreation area.

837. Sandy Hook (Monmouth County): This site extends northward 5-1/2 miles from Highlands and shelters Sandy Hook Bay from the Atlantic. This is one of the outstanding coastal areas within the Greater New York Metropolitan Area. Its four biotic communities, beach grass, shrub, forest, and salt marsh are as typical and as nearly natural as any in New Jersey. They contain a good variety of plant species including American holly and beach plum. The total coastline is approximately 13 miles on both the Atlantic Ocean and Sandy Hook Bay. The beach is clean, light-colored sand, approximately 250 feet in width and slopes rather steeply into the water.

838. The entire peninsula is a United States military reservation and is not immediately available as a public recreation area. When and if this area becomes surplus to the needs of the Federal Government, it should be acquired for public park and recreation area purposes.

839. National Guard Beach (Monmouth County): Located between Sea Girt and Manasquan Beach, this site containing 2,400 feet of undeveloped beach and approximately 300 acres of land is occupied by the New Jersey National Guard.

840. When and if this site becomes surplus to the needs of the National Guard it should be dedicated to public seashore park purposes.

841. Raritan Arsenal (Salem County): The Delaware Storage Activity of the Raritan Arsenal occupies several hundred acres of potentially valuable nonurban recreation lands along the Delaware River. This site is now owned by the Federal Government and is being used for military purposes.

842. The site is well-wooded, contains marshes, small streams and considerable river frontage. The location of the area with respect to the metropolitan region surrounding Camden suggest its possible use for nonurban recreation purposes when and if the property should become surplus to the needs of the Federal Government.

843. Corsons Inlet Beaches (Cape May County): Six miles south of Ocean City on either side of Corsons Inlet are two undeveloped beaches. The north beach is about 3,000 feet long and the south beach about 1,000 feet. Together the beaches comprise approximately 100 acres of land. A large portion of the south beach would be awash at extreme high tides or during storms. The north beach is higher and relatively stable. There is little vegetatation on the areas. The south beach would appear to be unsafe for swimming while the north beach should be satisfactory.

844. North Hereford Inlet Beach (Cape May County): One mile of undeveloped beach extends from the south end of the borough of Stone Harbor to Seven Mile Point. This beach contains an excellent example of the original plant-animal community typical of the New Jersey coast. The site is adjacent to a bird sanctuary set aside by Stone Harbor. The lower bay side is marshy and subject to erosion.

845. The sanctuary and as much buffer strip as possible should be preserved in public ownership and eventually developed as a seashore park.

846. Two Mile Beach (Cape May County): Extending from the south end of Wildwood Crest to Cold Spring Inlet are two miles of undeveloped beach. Most of the site is contained in a military reservation of the U.S. Coast Guard as an electronics engineering station. The remainder is privately-owned and contains one large beach club. The beach is wide, flat, and clean. Sand dunes are low, numerous, and stable. The entire area has a good cover grass and shrubs, and on the southern portion is a long narrow grove of good sized trees.

847. The presently undeveloped beach outside the military reservation should be acquired and added to the military reservation when and if this property should become surplus to Government needs. The entire area would be particularly adaptable for a seashore park.

848. West Cape May Beach (Cape May County): Located between Cape May and Cape May Point is 1-1/4 miles of undeveloped beach. This area is a part of the coastal headland of Cape May. The beach is narrow, dark-stained, and the dunes are low and unstable. The land behind the dunes is low and marshy and contains a small pond.

849. This open space is recommended for acquisition for eventual development as a seashore park.

850. Cox Hall Creek (Cape May County): Extending for one mile north of the mouth of Cox Hall Creek to Wildwood Highlands Beach is an undeveloped area of high ground on the shore of Delaware Bay. A ridge of dunes up to 20 feet high parallels a narrow beach. The inland portion is gently rolling and is drained by Cox Hall Creek. A portion of the inland section has been mined for gravel. A mixed stand of oak, cedar, holly, and pines cover most of the area. The waters of Delaware Bay at this point are turbid, apparently due to silt in suspension. A road has been cleared through the entire length of the tract as a part of a real estate venture.

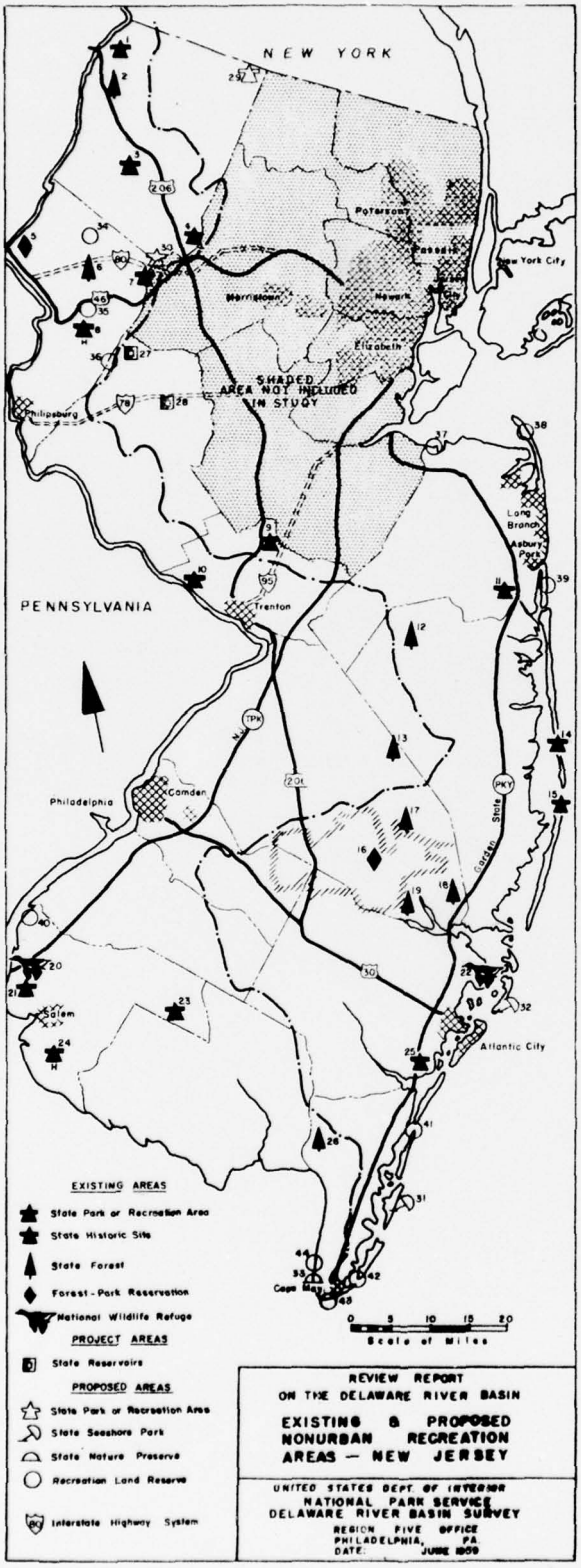
851. Since this is the sole remaining high ground fronting on Delaware Bay in this region of the State, it is recommended that the area be acquired for later development and use.

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REPORT ON THE COMPREHENSIVE SURVEY OF THE WATER RESOURCES OF TH--ETC(U)
DEC 60

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REVIEW REPORT
ON THE DELAWARE RIVER BASIN

EXISTING & PROPOSED
NONURBAN RECREATION
AREAS — NEW JERSEY

UNITED STATES DEPT. OF INTERIOR
NATIONAL PARK SERVICE
DELAWARE RIVER BASIN SURVEY
REGION FIVE OFFICE
PHILADELPHIA, PA.
DATE: JUNE 1959

EXISTING NONURBAN RECREATION AREAS

1 High Point State Park
2 Stokes State Forest
3 Swartswood State Park
4 Hopatcong State Park
5 Worthington Tract Forest-Park Reservation (Undev.)
6 Jenny Jump State Forest
7 Stephens State Park
8 Oxford Furnace State Historic Site
9 Princeton Battlefield State Park
10 Washington Crossing State Park
11 Allaire State Park
12 Jackson State Forest
13 Lebanon State Forest
14 Island Beach State Park
15 Barnegat Lighthouse State Park
16 Wharton Tract Forest-Park Reservation
17 Penn State Forest
18 Bass River State Forest
19 Green Bank State Forest
20 Killcohook National Wildlife Refuge
21 Fort Mott State Park
22 Brigantine National Wildlife Refuge
23 Parvin State Park
24 Hancock House State Historic Site
25 Somers House State Historic Site
26 Belleplain State Forest
Cranberry Lake State Park (Included within proposed Allamuchy Mountain Area)
Lake Musconetcong State Park (Recommend transfer to local government)
Mount Laurel State Park (Recommend transfer to Burlington County)
Voorhees State Park (Recommend transfer to Hunterdon County)

NONURBAN RECREATION PROJECT AREAS

27 Spruce Run Reservoir
28 Round Valley Reservoir

PROPOSED NONURBAN RECREATION AREAS

29 Wawayanda Lake Area
30 Allamuchy Mountain Area
31 Seven Mile Beach
32 Absecon Inlet Beach
33 Higbee Beach

RECREATION LAND RESERVES

34 Paulina Reservoir
35 Pequest Reservoir
36 New Hampton Reservoir
37 Conoskonk Point
38 Sandy Hook
39 National Guard Beach
40 Raritan Arsenal
41 Corsons Inlet
42 North Hereford Inlet Beach
43 West Cape May Beach
44 Cox Hall Creek

PLATE 28

NONURBAN RECREATION PLAN - NEW YORK (See Plate 29, following Page 196)

852. The nonurban recreation problem in the New York portion of the Delaware River Basin is concerned almost exclusively with providing vacation opportunities for non-Basin residents. The resident population of this region, Sullivan and Delaware Counties, is confined to small towns or is rural and does not in itself generate a significant recreation problem. In fact, much of this population is engaged in providing recreation opportunities for the influx of vacationists from out of the Basin. For the most part, the resident population finds ample opportunities for out-of-door enjoyment in their immediate surroundings and share these resources with visitors who come into the Basin for vacation purposes. Generally, this portion of the Basin is too far removed from population centers to be used for intensive day-use purposes except perhaps in connection with resorts located in the area.

853. The New York portion of the Delaware River Basin contains some of the most spectacular scenery to be found in the entire drainage; however, remaining opportunities for the development of nonurban recreation centers in this region for the accommodation of a large number of visitors is limited. Generations ago, private interests appropriated the many lakes and better recreation sites in Sullivan County for resort purposes. Newer resort developments have pushed westward into less desirable areas. Water impoundment sites have been developed for water supply purposes and are closed to public recreation uses. The steep topography of the remaining undeveloped regions does not lend itself to the development of recreation areas of adequate size to accommodate a reasonably large visitor load. A deterrent to the development of extensive nonurban recreation areas in Delaware County is the presence of New York City water supply reservoirs in the lower reaches of the East and West Branches of Delaware River and the opposition that would result from any intensive use areas above these impoundments. It then appears that the recreation opportunities offered by the New York portion of the Basin will continue to be those associated with resort activities and such nonurban facilities that may be developed within the Catskill Park.

IMPROVEMENT OF EXISTING NONURBAN RECREATION AREAS

854. The State forest preserve lands in the Catskill Mountains total a quarter of a million acres. Approximately 40 percent of this area lies within the Delaware River Basin. A delineated boundary surrounding the great bulk of these lands encompassed a total area of approximately 1-million acres and is defined as the Catskill Park. Land acquistion within this boundary has been a continuing program for many years.

855. Catskill Park: That portion of the Catskill Park in the Delaware Basin produces meager returns to the public in the form of visitor days of use in proportion to the total land area. Although

the park is available for such use, this small return is due to the lack of facilities. Lands contained within Catskill Park are a part of the State's forest preserve.

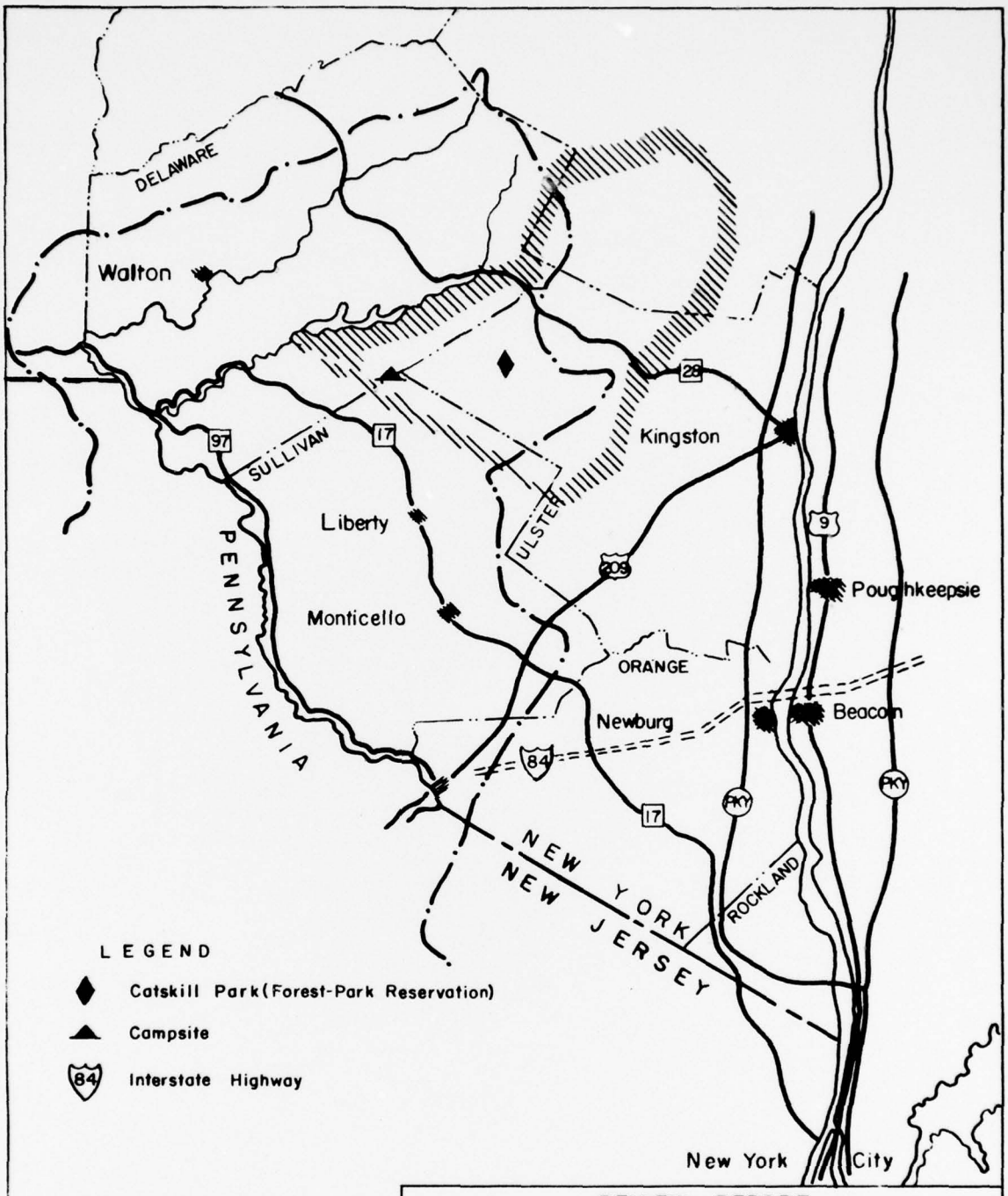
856. Section 1 of the State Constitution specifies that "..... lands of the State, now owned or hereafter acquired, constituting the forest preserve as now fixed by law, shall be forever kept as wild forest lands. They shall not be leased, sold or exchanged, or be taken by any corporation, public or private, nor shall the timber thereon be sold, removed or destroyed....". Timber cutting for access roads, recreation areas, or the erection of buildings has been interpreted as a violation of this section. If forest preserve lands are to yield a substantial return in the form of public recreation it will be necessary to make these lands more readily available to the public through access roads and developed recreation areas. It has been held that lands acquired within Catskill Park for other than forest preserve purposes are not subject to the restrictions imposed by Section 1 of the State Constitution.

857. The forest preserve lands in Catskill Park are confined for the most part to mountain tops and steep hillsides which are not readily adaptable to recreation developments. In connection with the further acquisition of land within Catskill Park, consideration should be given to tracts or areas that lend themselves to greater use and development for recreation.

858. Recognizing that the Basin portion of Catskill Park is topographically rough and lacking in sites where recreation water areas could be developed on a large scale, certain improvements could be provided that would yield a greater public recreation benefit. Public use areas will, of necessity, be confined to stream courses where small tracts of usable land are available. It is recommended that the present system of forest camps be expanded to include additional camping areas along streams and existing roads. These camp sites should be relatively small developments, accommodating not more than 100 camping parties. Existing roads could provide general access with spur or dead end roads serving the camp site. In this manner it would be possible to develop a large number of sites along any stream course at selected locations. Small impoundments, if desired, could be created by the construction of low dams to provide small bodies of recreation water that could be contained with the stream banks.

859. Retention of the wild character of Catskill Park is considered to be highly desirable. This type of environment has disappeared over much of the Basin, and this may very well be the last opportunity to preserve so vast an area close to the Nation's largest population center. The type of development suggested above would provide opportunities for greater public use for those who desire to experience camping in keeping with the wild nature of the Catskill Mountains.

860. In addition, it is recommended that Beaver Kill Campsite be redesigned into a major nonurban recreation area. It would be possible to create an impoundment of 450 surface acres by placing a dam in Beaver Kill 2.5 miles north-northeast from the town of Roscoe. The topography and the cover surrounding this site are favorable for the development of a significant vacation camping area. The bulk of the area surrounding the site lies on private property within the boundary of Catskill Park, and could be acquired for recreation purposes free of the restrictions imposed upon forest preserve lands by the State Constitution.



REVIEW REPORT
ON THE DELAWARE RIVER BASIN

EXISTING
NONURBAN RECREATION
AREA — NEW YORK

UNITED STATES DEPT. OF INTERIOR
NATIONAL PARK SERVICE
DELAWARE RIVER BASIN SURVEY
REGION FIVE OFFICE
PHILADELPHIA, PA.
DATE: JUNE 1959

PLATE 29

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NONURBAN RECREATION PLAN - PENNSYLVANIA (See Plate 39 following page 224)

861. The studies and investigations conducted in the Pennsylvania portion of the Delaware River Basin have indicated a great need for nonurban recreation opportunities in the vicinity of the metropolitan areas of Philadelphia, Easton-Allentown-Bethlehem, and Reading. An overwhelming proportion of the population resides in these areas, and it is here that nonurban recreation opportunities are least. In fact, one-third of the population of Pennsylvania resides in Philadelphia and the four surrounding counties. The upper Basin portion of the State is rural and contains numerous large State parks, 71,000 acres of State forest land, and a considerable number of private resort facilities.

862. Plate 39 might seem to indicate a wealth of nonurban recreation opportunities in the southern densely populated portion of the Basin, and an adequate number of areas in the rural northern portion. Of the 12 nonurban recreation areas located in the vicinity of the metropolitan areas, only 3 of these, French Creek, Valley Forge, and Washington Crossing State Parks are making substantial contributions to fulfilling nonurban recreation needs. The remainder are historic sites or small parks serving essentially local needs. The areas indicated in the Upper Basin portion of the State are, for the most part, spacious areas containing a wealth of recreation resources, and offering a wide variety of nonurban recreation opportunities. These areas now serve the metropolitan regions of the Basin as sites for weekend and vacation purposes; however, they are somewhat remote to serve day-use needs for a very large proportion of the population.

863. The nonurban recreation problem in the Pennsylvania portion of the Basin is concentrated in the southern half and is directly related to metropolitan centers. The major problem area is the Greater Philadelphia region including the four surrounding counties, Bucks, Montgomery, Chester, and Delaware. Similar situations, but to a lesser degree, exist in the Allentown-Bethlehem-Easton, and the Reading areas. The basic need in each of these regions is concerned with adequate nonurban recreation space and facilities close to population centers, primarily for day outings but also providing opportunities for extensive activities such as camping and boating.

864. There appears to be two distinct levels of responsibility in solving this problem in each metropolitan region. The first, is at the regional or metropolitan level, and the second would be a State responsibility. Essentially local recreation needs should be provided for by local government. In view of the number of political subdivisions making up each metropolitan region, this could be best accomplished through a united effort in the form of a metropolitan or regional park organization. It would be the function of this organization to acquire, develop, maintain, and operate a system of parks and recreation areas for a wide variety of day-use purposes. These parks should, to a large degree, fill the void between city parks and State parks. Since there are no metropolitan or regional park organization in the Pennsylvania

portion of the Basin, areas to be administered by this type of agency have not been proposed. However, it is recommended that such an agency be created in each of the metropolitan regions named above.

865. It has long been recognized that State government has a definite responsibility to provide public nonurban recreation space and facilities. The present State areas available to the residents of the metropolitan regions are inadequate in space and/or facilities to meet the needs. There is a particular deficit of recreation water and land suitable for both intensive and extensive recreation activities. Of particular concern is securing a balance between usable recreation land and recreation water. For example, the 6,000 acres of French Creek State Park is rich in suitable recreation land but poor in recreation water. Although this park receives 1.5 million visitors annually, the land area could produce a greater public recreation benefit without the loss of resource values if it were possible to distribute visitors over a larger area of the park. Present use is concentrated around the two small lakes.

866. The general region surrounding the metropolitan areas does not contain pristine sites that should be acquired for State park purposes because of their outstanding scenic, scientific or historic values; however, there are numerous potential sites with adequate scenic, topographic, and water resource features to warrant their development for nonurban recreation purposes. Therefore, the recommendations contained in this plan are concerned primarily with sites that possess the best possible combination of topographic forest and recreation water resources now available, or which could be developed as the result of reservoir construction.

867. The primary objective of this plan is to designate those sites that have the most significant values of public nonurban recreation. Consideration has been given to the over-all setting with special attention to scenic features, geographic location of the site, access routes, and the population to be served. These recommended sites might be described as "intermediate areas" between "user oriented parks" and strictly "resource oriented parks".

PHASE ONE

868. This phase includes the improvement of existing areas, the completion of project areas, the acquisition and development of new sites and the acquisition of recreation land reserves for deferred development.

IMPROVEMENT OF EXISTING NONURBAN RECREATION AREAS

869. Virtually every publicly-owned nonurban recreation area in the Pennsylvania portion of the Basin is overtaxed by visitor impact. This applies to impact upon facilities and resources, particularly those resources and facilities used primarily for day-use activities. Recreation space and facilities might have been adequate for conditions

that existed 20 years ago, but expansion and development have not kept pace with the requirements of people today.

870. The Department of Forests and Waters is presently engaged in an active program of developing those state parks in the Basin portion of the State that possess adequate space and resources. Notable in this regard is Promised Land State Park where the Lower Lake section is being developed with camping facilities apart from day-use areas, and cottage developments. Camping facilities are also being installed in Tobyhanna State Park. Newly constructed Gouldsboro State Park with day-use facilities is operated in conjunction with Tobyhanna. Picnic space and facilities are planned for Roosevelt and Fort Washington State Parks. The improvement of sanitary facilities in all areas is an over-all objective not specifically directed at increasing visitor capacity.

871. Inadequate space and/or lack of recreation water limits the increase in the visitor use of other areas. Of particular interest in this regard are French Creek and Hickory Run State Parks. Both of these parks were established as Recreation Demonstration Areas in the 1930's under the Submarginal Land Act and developed under the technical direction of the National Park Service. Organized Group Camps were developed in each of these areas prior to the curtailment of the program and transfer of the areas to the State. Day-use facilities were later installed by the State. Time has since proven that the resource, particularly recreation water, is inadequate to meet the present day-use visitor demand. Enlargement of present water areas or the creation of new ones, in these two parks, is impractical. The State is now looking to new sites to meet present and future recreation needs.

872. Notable among the small State parks which are hampered both as to size and expansion possibilities are George W. Childs and Ralph Stover. The present resource and extent of usable land in these parks and surrounding areas precludes any substantial increase in the visitor use of either park.

873. Each nonurban recreation area within the Basin portion of the State should be thoroughly analyzed with a view to (1) determining the visitor load of each area in comparison with the available space and resource, and (2) improving the quality of visitor facilities that are determined to be appropriate for each area.

Recommendations with regard to specific areas follow:

STATE PARKS

874. Big Pocono State Park: In view of the scarcity of winter sport centers on public recreation lands, studies should be undertaken to determine the feasibility of developing a skiing area on the north slope of Big Pocono Mountain.

875. Brandywine Battlefield State Park: The Battle of Brandywine

was one of the more important Revolutionary War battles that took place in the Delaware River Basin and preceded the capture of the New Nation's Capital at Philadelphia. The site of this important battle is intact and unoccupied except as farmland. The present park commemorating this battle includes only a small portion of the Battlefield site.

876. The present boundary of the park should be extended to include the battlefield site, the John Chadd House, the house used by General Sir William Howe after the battle, and detached parcels of land where significant battle action took place, and the entire park area should be developed to adequately convey the significance of the history associated with the site.

877. Fort Washington State Park: Complete the proposed development of the Militia Hill section for picnicking, and transfer the park to the Montgomery County Park Board, or to a metropolitan park organization for the administration of parks in the Philadelphia Metropolitan Area.

878. F[illegible] Creek State Park: Redevelop the park primarily for organized [illegible] and family camping, and introduce additional extensive nonurban [illegible]ion activities such as conservation training, scouting and woo[illegible]t, forestry, and game management. Relocate all day-use activities to the proposed French Creek Reservoir site, one of the principal areas in Phase One of this plan.

879. George W. Childs State Park: In view of the scenic qualities of the Dingman Creek Gorge and Dingman Falls and its proximity to the proposed Tocks Island Project, this park should be made a part of the Tocks Island Reservation, when established.

880. Roosevelt State Park: In order to preserve the scenic values along the Delaware Canal and the Delaware River, a concerted effort should be made to acquire the lands between the Canal and the River, wherever practical, and the river bluffs throughout the length of the park. Consideration should be given to the improvement and maintenance of State Route 32 and the present location of U.S. 611 as scenic tour routes.

881. Hickory Run State Park: Develop additional organized group and family camps and introduce other nonurban recreation activities such as conservation training, scouting and woodcraft, forestry and game management. Relocate day-use activities to the nearby proposed Mud Run Reservoir Project which could be added to the park when completed.

882. Ralph Stover State Park: Transfer this park to the Bucks County Park Commission for administration as a county park.

883. Valley Forge State Park: Relocate all State Highways outside park. Expedite the program of restoring historic buildings and the winter encampment scene of 1777-78.

884. Washington Crossing State Park: Acquire the intervening lands between the presently detached units that now comprise the park.

STATE FORESTS

885. Delaware State Forest: This 71,000-acre forest is extensively used for all types of nonurban recreation, and State parks have been carved from its acreage. Unfortunately, from a public-use point of view, most of the better recreation sites, especially lake frontage, have been pre-empted for forest camp (summer cottage) purpose. Of the 4,500 summer cottage sites located on State forest land throughout the State, 1,000 are within the Delaware State Forest.

886. Consideration should be given to confining summer cottage sites on State forests to areas not primarily valuable for public recreation use and particularly away from lake fronts. Lake front properties pre-empted for cottage purposes should be reclaimed for public use by non-renewal of lease agreements at the expiration of the life of present improvements.

STATE GAME LANDS AND PUBLIC FISHING AREAS

887. In view of the over-all space needs for nonurban recreation in the Pennsylvania portion of the Basin, it is recommended that the resources of State game lands and public fishing areas be thoroughly studied with a view to possible multiple-recreation use of these areas. The need for public hunting and fishing areas is fully recognized. However, other uses of these lands, that might be permitted, should not infringe upon hunting and fishing activities.

HISTORIC SITES

888. Adequate interpretation of Pennsylvania's historic sites is of utmost importance. This also applies to the interpretation of the natural, archaeological, and historic features of the State parks. The full benefit to the visitor in any of these areas is largely dependent upon proper presentation of its special features.

889. The interpretation of a given area may involve a number of techniques - literature, museums, trailside exhibits, nature trails, conducted tours, campfire programs, self-guiding tours, interpretive signs, and other devices. The State's historic sites and parks might employ a number of these methods to present the inspirational and educational values of each area.

890. The historic sites and State parks need additional interpretive treatment. The possibilities for popular education in describing the events of each area in National and State history have not been exhausted.

PROJECT AREAS

891. The Department of Forests and Waters, the Historical and Museum Commission, the Game Commission, and the Fish Commission in carrying out their respective programs to provide a wider range of nonurban recreation opportunities for the people of Pennsylvania



have initiated action or have indicated an intent to include the following areas within their respective systems.

DEPARTMENT OF FORESTS AND WATERS

892 Prompton Reservoir: The Corps of Engineers, Department of the Army, is now (1959) constructing a dam in the Lackawaxen River in Wayne County within the limits of the Borough of Prompton and 4 miles west of Honesdale. The primary purpose of this dam and reservoir is for flood control. The reservoir will have a conservation pool 3 miles long with an average width of 1,000 feet through 75 percent of its length, and a maximum depth of 35 feet at the dam. The surface area will be 280 acres.

893. The Pennsylvania Department of Forests and Waters will acquire all of the land, a minimum of 112 acres, on the western side of the permanent pool, lying between the limit of the Federal fee purchase, and the relocated highway and other contiguous lands that may be available. These lands will be used for the development of a bathing beach, picnic area, parking space, sanitary and dressing facilities, water supply, and possibly a camping area if a suitable site above flood level can be located.

894. Bear Creek Reservoir: The Bear Creek Reservoir is being constructed (1959) by the Corps of Engineers, Department of the Army, as a flood control project in the Lehigh River. The dam site is located in Luzerne County, 11 miles southeast of Wilkes-Barre, immediately below the confluence of Bear Creek and the Lehigh River. The reservoir will have a conservation pool of 90 acres and a maximum depth of 50 feet at the dam.

895. The Pennsylvania Department of Forests and Waters intends to develop lands acquired by the Corps of Engineers which appears to be of sufficient acreage and location to permit the placement of appropriate recreation facilities. An area near the dam will be graded for a bathing beach, and boat launching and mooring facilities will be installed. In addition, picnic areas will be developed, a vista or overlook will be provided, and if an appropriate site can be located, a camping area will be developed.

896. Logan Estate: The Department of Forests and Waters has acquired two parcels of land of 157 acres and 87 acres on the Delaware River at the mouth of Neshaminy Creek. The tracts are on opposite sides of the Creek. A development plan for this park provides for a marina as the primary facility, and as secondary facilities, picnic and play areas.

HISTORICAL AND MUSEUM COMMISSION

897. Hope Lodge State Historic Site: The mansion home of Samuel Morris, built in 1723, is surrounded by 40 acres of farmland. It is approximately 1 mile west of Fort Washington at the outskirts of Philadelphia.



898. Although built for his bride-to-be, Morris lived in the mansion as a bachelor until his death in 1770. The mansion is a stone structure with a brick facade and is a fine example of Georgian architecture, with an irterior worthy of its outward beauty. The period characteristics of the house are being restored.

899. Graeme Park State Historic Site: Graeme Park was built by Provincial Governor William Keith in 1721-22 for use as a malt house, and was remodeled in 1739 by the Graeme family for use as a residence. Dr. Graeme was a physician, judge of the Supreme Court,and member of the Provincial Council.

900. Future development of Graeme Park will be based upon archaeological research which has determined the location of walks, drives, and sites of numerous outbildings. The main building is being stabilized and the grounds will be landscaped. Final development will include a small reception center, office, and restroom.

PROPOSED NEW DEVELOPMENTS

901. The following new developments are recommended for addition to the State park system. The order of arrangement in the plan indicates the recommended priority.

NEWTOWN RESERVOIR SITE (Bucks County)
Proposed Newtown Reservoir Project

Location The proposed Newtown Reservoir is located 20 miles northeast from the center of Philadelphia and 12 miles west of Trenton, New Jersey. Numerous State roads provide access to the area.

This site is ideally situated with respect to population centers and potential park visitors. Within 25 miles of the site is the Philadelphia Metropolitan Area with its 4 million residents and the Trenton Metropolitan Area with a quarter million population.

Recreation Resources The proposed water control structure on Neshaminy Creek would create an impoundment of 1,900 acres with approximately 40 miles of shoreline. Long arms of the reservoir would extend up Little Neshaminy and Mill Creeks. The shoreline would be irregular with countless bays, necks, and points.

Of considerable importance at this site is the wide expanse of open land readily adaptable for intensive nonurban recreation purposes. The land for the most part is rolling with gentle slopes to the waterline providing excellent sites for the development of beaches and other waterfront facilities. The terrain is ideally suited for the development of facilities to accommodate large visitor loads.



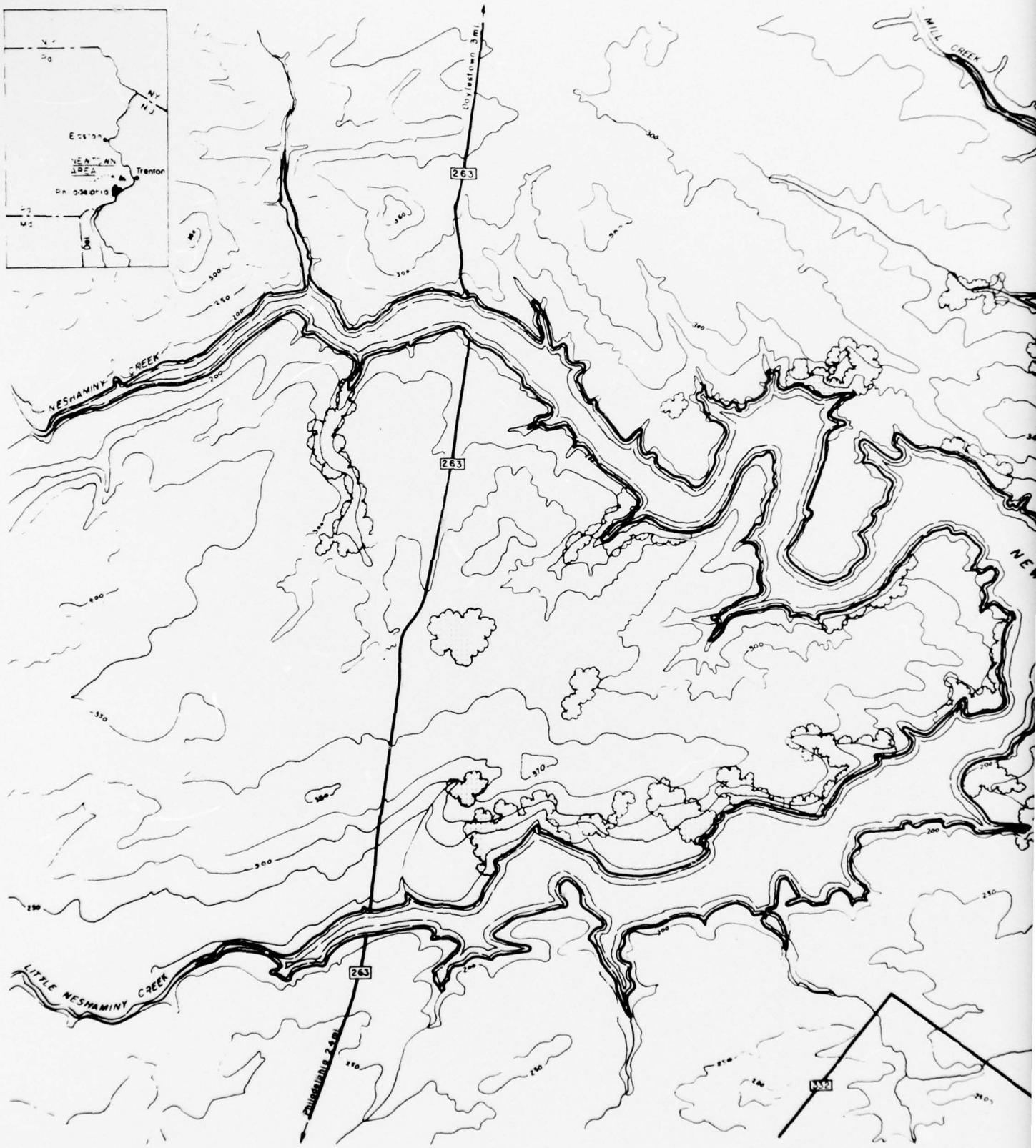
Looking upstream through the reservoir site.

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Forest cover is confined for the most part to the stream banks.

Recommended Purpose and Uses — It is recommended that the Newtown Reservoir site be acquired and developed as a State park or recreation area. The site should be developed primarily for intensive day-outing purposes with facilities for swimming, boating, fishing, picnicking, field sports, and related activities.

Estimated Annual Visitation	1,500,000
Acreage Requirement	10,200 acres
Cost of Physical Improvement	$6,000,000


Trenton
Doylestown 3mi
263
MILL CREEK
NESHAMINY CREEK
LITTLE NESHAMINY CREEK
Philadelphia 24mi
332

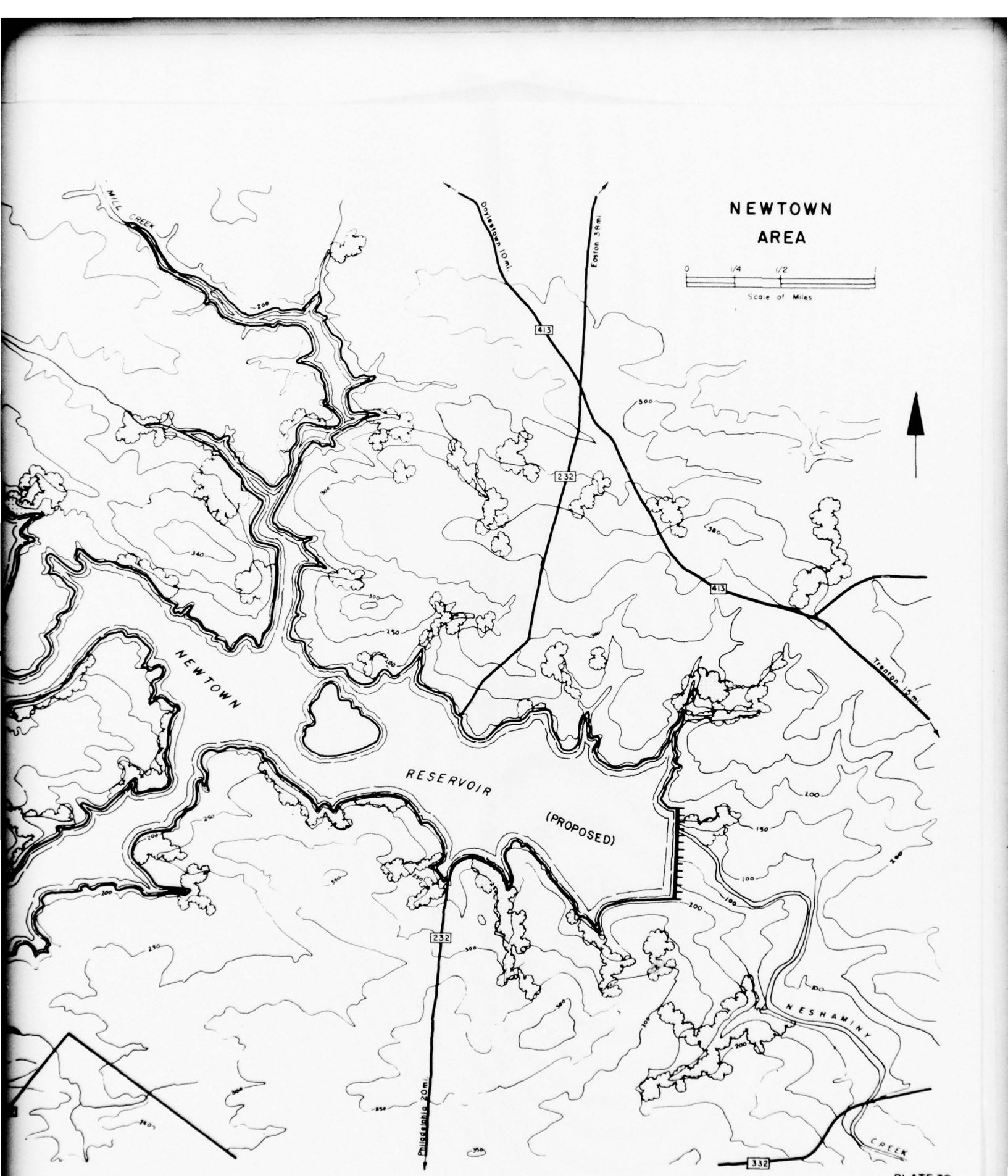

NEWTOWN
AREA
0 1/4 1/2 1
Scale of Miles
MILL CREEK
Doylestown 10 mi.
Easton 38 mi.
413
232
413
NEWTOWN
RESERVOIR
(PROPOSED)
Trenton 15 mi.
232
Philadelphia 20 mi.
NESHAMINY
CREEK
332

PLATE 30

BARON HILLS AREA (Chester County)
Pennsylvania Department of Forests and Waters
Proposed Reservoir WA-7

Location The Baron Hills Area is located 38 miles west of Philadelphia, 18 miles south of Reading and 22 miles east of Lancaster. U.S. Route 322 passes through the site and the Morgantown and Downingtown Interchanges of the Pennsylvania Turnpike are within 10 miles.

The location of this site is particularly favorable with regard to population centers and potential park visitors within day-use driving time and distance. The Schuylkill Expressway leads directly from the heart of Philadelphia and connects with the Pennsylvania Turnpike and brings this metropolitan region to within a driving time of 1-1/2 hours or less. The total population residing within a day-use radius of the site would be approximately 4,000,000.

Recreation Resources The Baron Hills Area would include a reservoir with a maximum surface area of 1,000 acres and a minimum area of 245 acres. The minimum would occur only during periods of severe drought. There would be 20 miles of shoreline with considerable irregularity in the upper reaches while the lower end would be more regular.



Icedale Lake will be inundated by the proposed reservoir.

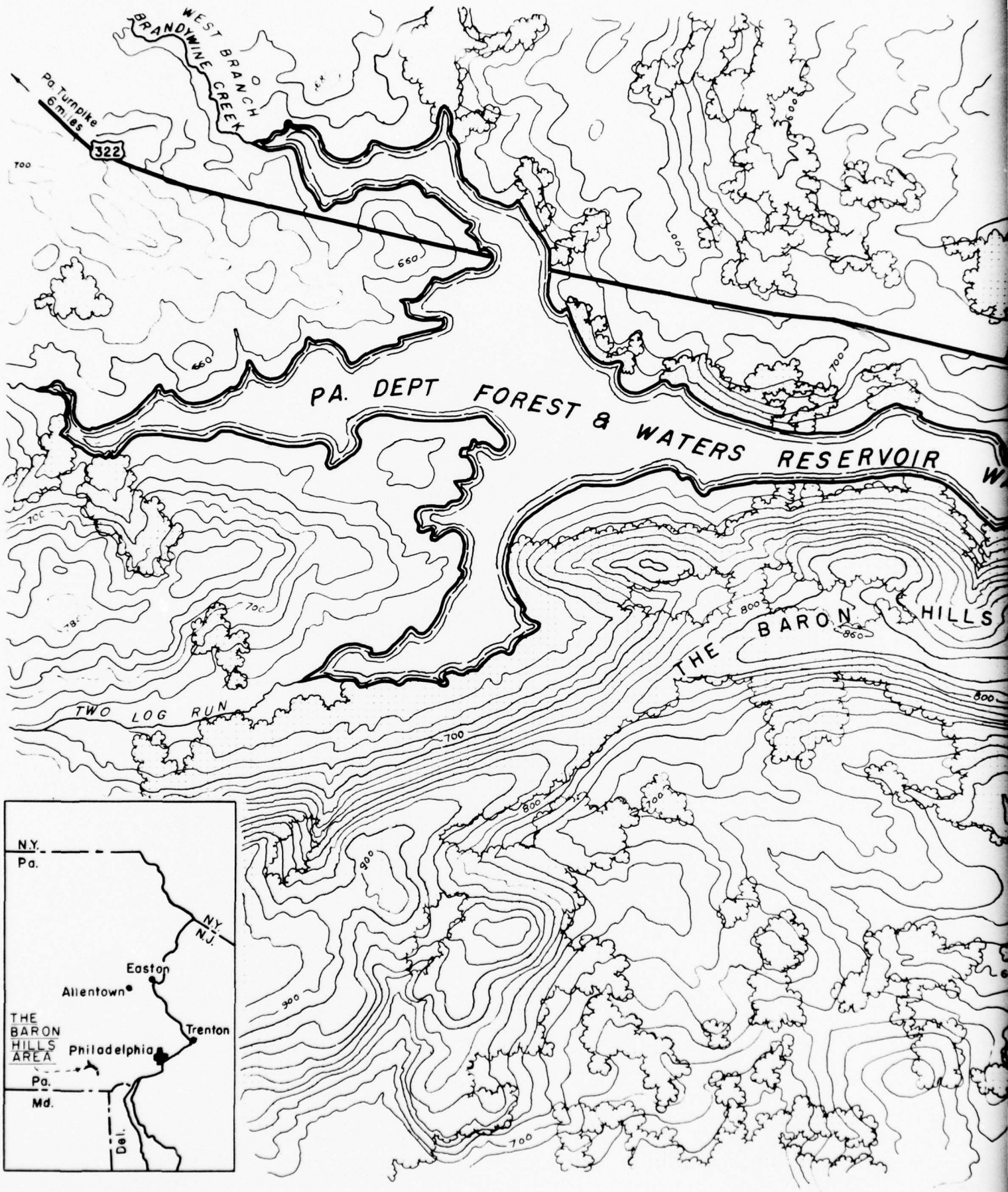
The topography of the land surrounding this reservoir site is ideal for the placement of recreation facilities. The entire north shore is a gentle gradient and readily adaptable for day-use recreation purposes. The principal feature of the south shore is Baron Hills which rises to an elevation of 860,feet and forms a scenic backdrop for day-use areas located on the north shore. This section would be suitable for picnic and camping areas.

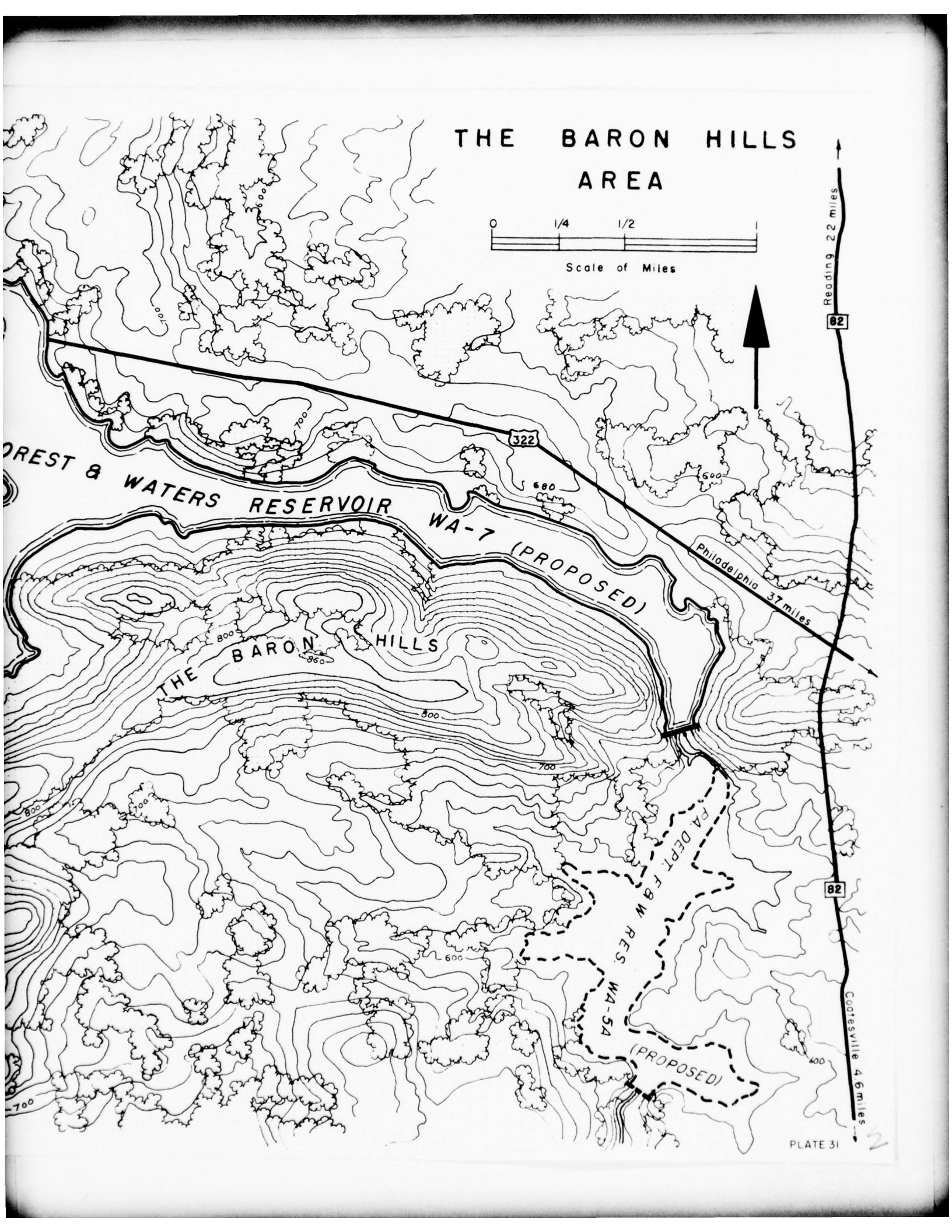
The vegetative cover of this area is suitable for the creation of a nonurban recreation area. The north shore is in agricultural fields with scattered groves of woodland. The Baron Hills on the south shore are well-wooded. The shore lands surrounding the upper reaches of the reservoir are primarily open.

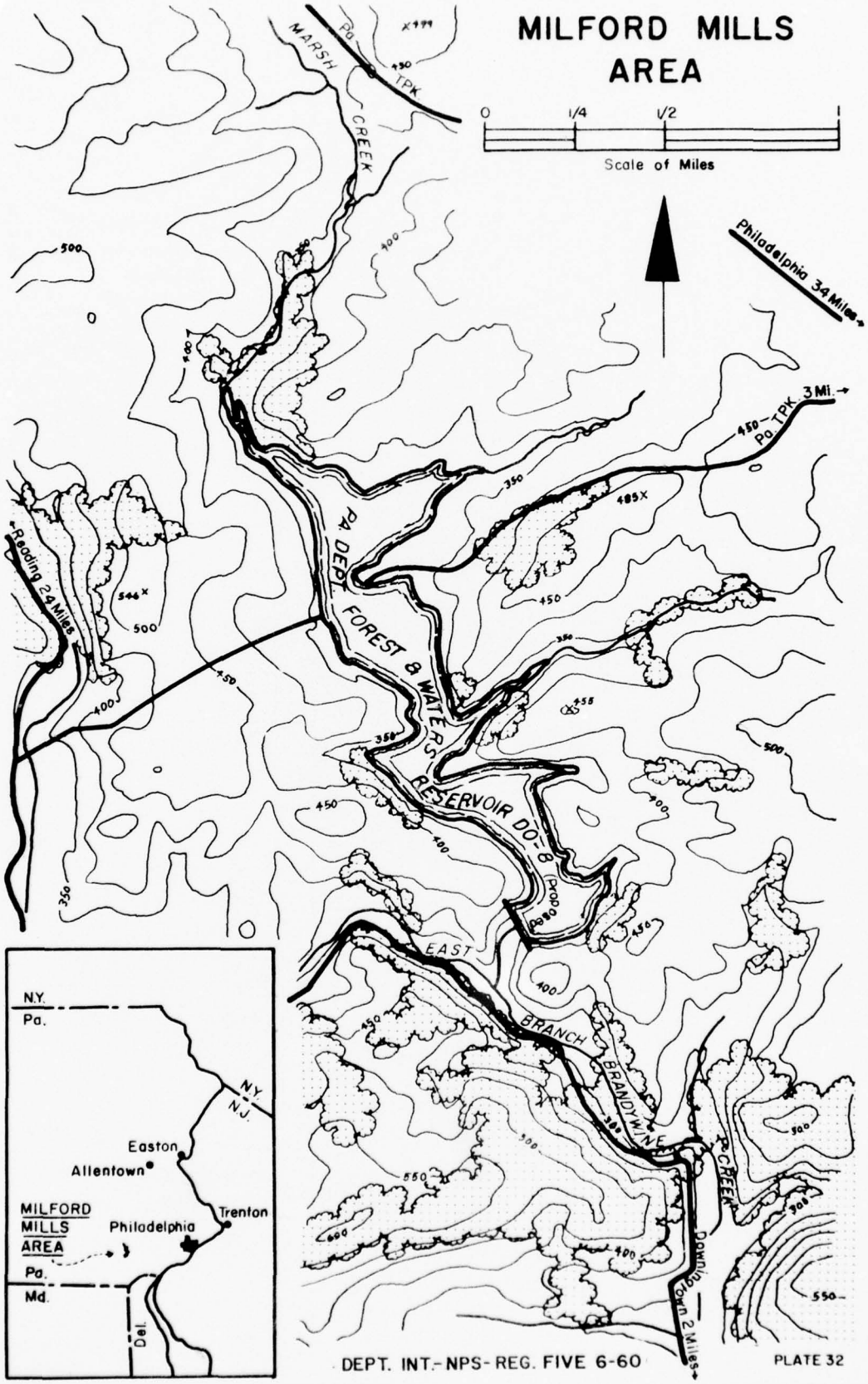
Included within the recreation resources of this area is the 215-acre reservoir identified as "DO-8". This project is proposed by the Pennsylvania Department of Forests and Waters for construction at the same time as WA-7. This impoundment would have 215 surface acres and 6.5 miles of shoreline. The topography surrounding this proposed reservoir is well suited for the installation of recreation facilities. The cover varies from agricultural fields to mixed hardwood forests.

Recommended Purpose and Uses — The Baron Hills Area is recommended for preservation and development as a State park or recreation area. This site is particularly adaptable to serve nonurban recreation needs in the Philadelphia Metropolitan Area. Facilities to provide opportunities for swimming, boating, fishing, picnicking, family unit, and group camping, hiking, and related activities could be provided. It is further recommended that the Milford Mills Area (Reservoir DO-8) be provided with minimum basic facilities for swimming, boating, fishing, and picnicking, and administered as a part of the Baron Hills development

Estimated Annual Visitation	1,000,000
Acreage Requirement	3,500 acres
Cost of Physical Improvement	$5,000,000


WEST BRANCH
BRANDYWINE CREEK
Pa. Turnpike
6 miles
322
PA. DEPT FOREST & WATERS RESERVOIR
THE BARON HILLS
TWO LOG RUN
700
800
900
N.Y.
Pa.
N.Y.
N.J.
Easton
Allentown
THE BARON HILLS AREA
Trenton
Philadelphia
Pa.
Md.
Del.


THE BARON HILLS AREA
0 1/4 1/2
Scale of Miles
Reading 22 miles
82
322
OREST & WATERS RESERVOIR WA-7 (PROPOSED)
Philadelphia 37 miles
THE BARON HILLS
PA DEPT F&W RES WA-5A (PROPOSED)
82
Coatesville 46 miles
PLATE 31

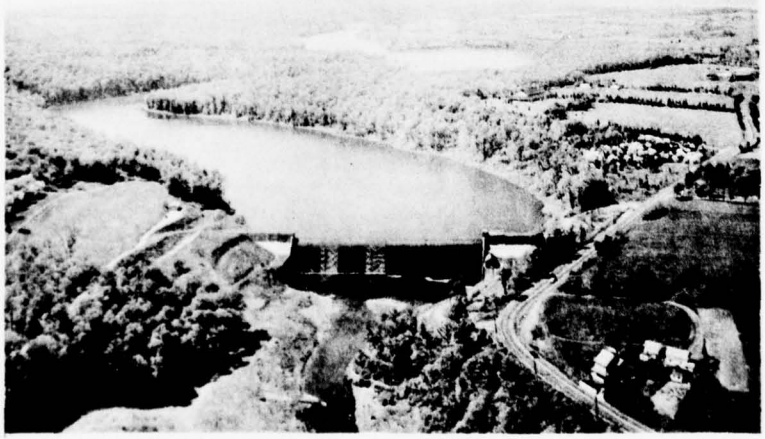

MILFORD MILLS AREA
0
1/4
1/2
1
Scale of Miles
MARSH CREEK
Pa. TPK
Philadelphia 34 Miles
3 Mi.
Pa. TPK
Reading 24 Miles
PA DEPT. FOREST & WATERS RESERVOIR DOT-8
EAST BRANCH BRANDYWINE CREEK
Downtown 2 Miles
N.Y.
Pa.
N.Y.
N.J.
Easton
Allentown
Trenton
Philadelphia
MILFORD MILLS AREA
Pa.
Md.
Del.
DEPT. INT.-NPS-REG. FIVE 6-60
PLATE 32

GREEN LANE RESERVOIR (Montgomery County)
Philadelphia Suburban Water Company

Location — Green Lane Reservoir is located 28 miles northwest from Philadelphia, 18 miles south of Allentown-Bethlehem, and 22 miles east of Reading. The site can be reached via several U.S. and State Highways and the Northeast Extension of the Pennsylvania Turnpike provides access from the Philadelphia and Allentown-Bethlehem Metropolitan Regions.

This site is most favorably located with respect to the population centers listed above. Day-use travel distance to the area would include all the principal population centers in the southeastern section of the State. The potential contributing population would exceed 5 million people.

Recreation Resources — The principal features of the Green Lane Reservoir Area that makes it particularly valuable for nonurban recreation are the 814 acres of recreation water and the great proportion of usable land surrounding the reservoir. The impoundment is relatively narrow in proportion to the total length. The shoreline is fairly regular, yet containing large bays and flat-topped promontories. The water quality is good and suitable for all appropriate forms of water recreation.

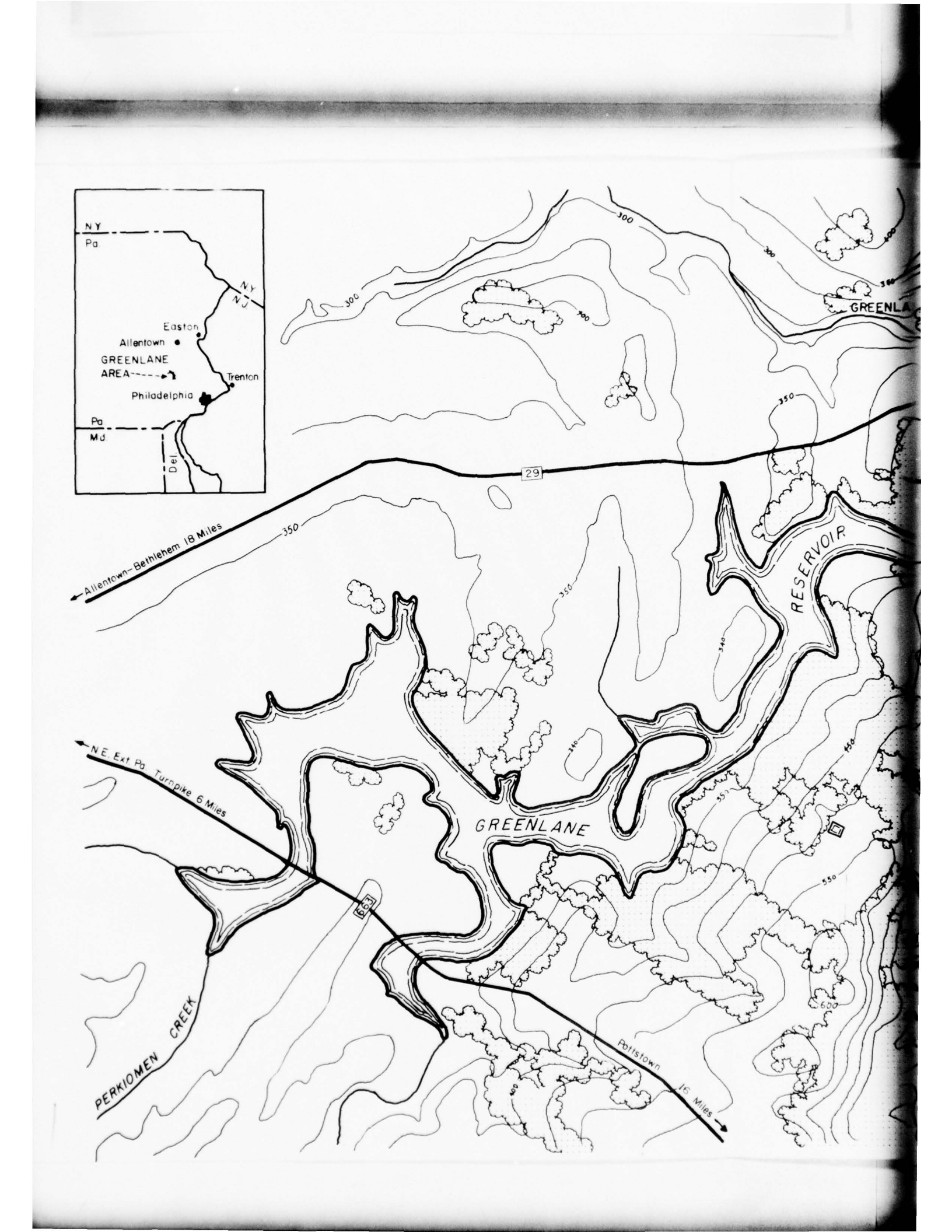


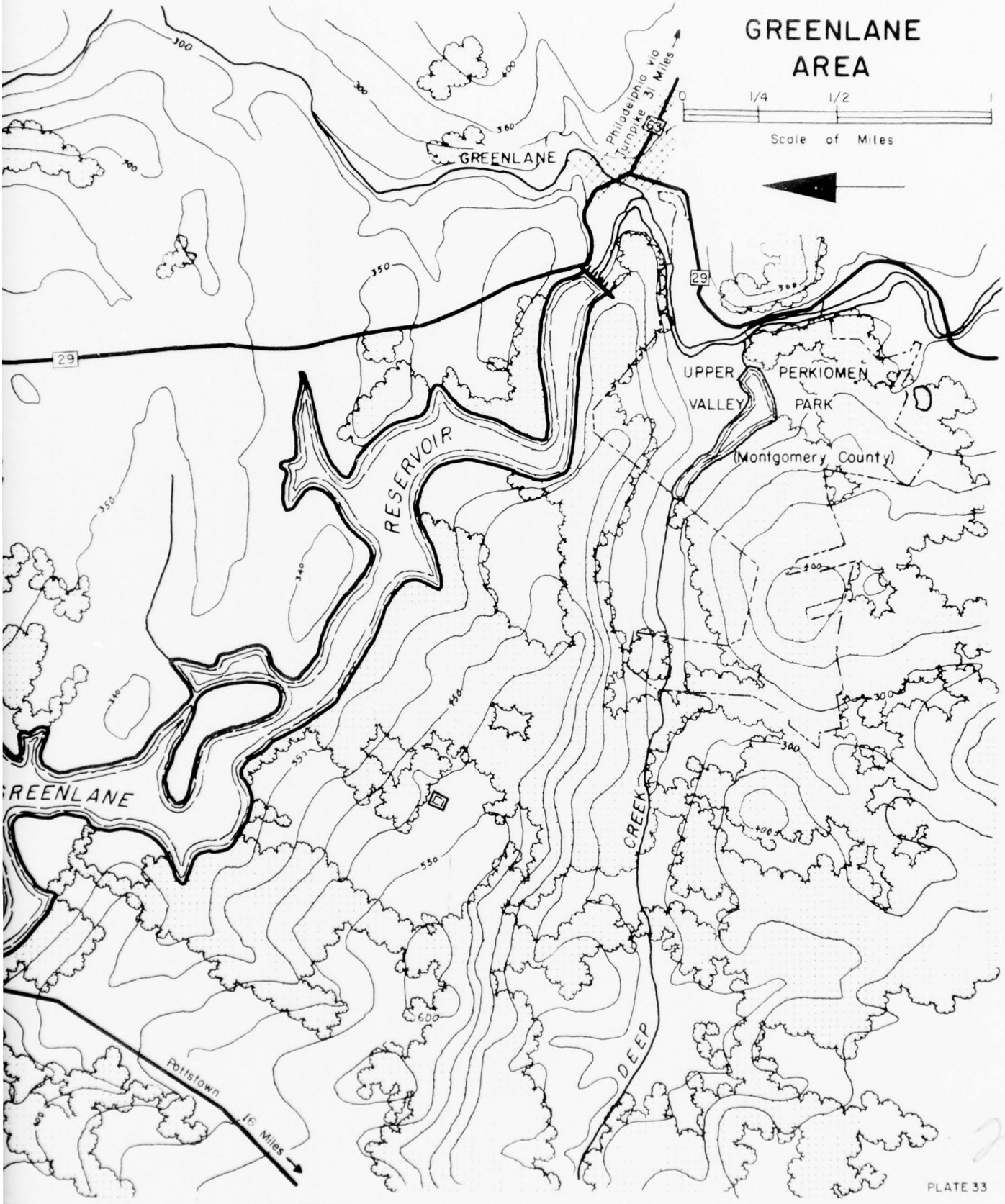
Green Lane Reservoir

From a topographic standpoint, the land features surrounding the reservoir are ideal for intensive recreation area development. With the exception of some steep slopes immediately above the dam, the entire shoreline is usable. The land on the north side of the reservoir is gently rolling and ideally suited for intensive day-use purposes. The south shore rises from the waters edge on a gentle gradient to a ridge top at an elevation of 600 feet.

Approximately 25 percent of the land is forested with mixed hardwoods and the remainder is in agricultural use or abandoned fields.

Recommended Purpose and Uses	It is recommended that the Green Lane Reservoir area be developed as a State park or recreation area primarily for day-use activities. Facilities for swimming, boating, fishing, group camping, hiking, nature study, and related activities should be provided.
Estimated Annual Visitation	1,500,000
Acreage Requirement	2,000 acres
Cost of Physical Improvements	$7,000,000


NY
Pa
NY
NJ
Easton
Allentown
GREENLANE
AREA
Trenton
Philadelphia
Pa
Md
Del
300
350
400
29
Allentown-Bethlehem 18 Miles
RESERVOIR
GREENLANE
N.E. Ext Pa Turnpike 6 Miles
63
PERKIOMEN CREEK
Pottstown 16 Miles


GREENLANE
AREA
0 1/4 1/2 1
Scale of Miles
GREENLANE
Philadelphia via Turnpike 31 Miles
29
UPPER PERKIOMEN VALLEY PARK
(Montgomery County)
RESERVOIR
CREEK
DEEP
Pottstown 16 Miles
PLATE 33

FRENCH CREEK AREA (Chester County)
Proposed French Creek Reservoir Project

Location The French Creek Area is located in the northwest portion of Chester County on French Creek. This site is centrally located with respect to population centers in southeastern Pennsylvania. Philadelphia is 31 miles east, Reading is 20 miles north and Lancaster is 40 miles southwest. Approximately 5 million people reside within 50 miles of the site.

A network of improved highways makes the area easily accessible from all directions. State Route 23 traverses the north portion of the site in an east-west direction and the Downington and Morgantown Interchanges of the Pennsylvania Turnpike are 7 and 10 miles distant to the south.

Recreation Resources The 1,100-acre lake that would be formed by the damming of French Creek above Birch Run would be the principal recreation attraction. Wooded hills that rise to an elevation of 300 feet above the valley floor along the entire south shore of the proposed impoundment will form a pleasing backdrop and the gently rolling terrain forming the north shore offers excellent sites for recreation development. The general setting, the shoreline topography, size of the proposed impoundment, accessibility by existing primary roads and its proximity to large urban population



French Creek Reservoir will have woodland on the south shore and open farmland on the north.

including the Philadelphia Metropolitan Area, combine to make this one of the most choice nonurban recreation sites in the Lower Delaware River Basin.

Recommended Purpose and Uses	It is recommended that the French Creek Area be preserved and developed as a State park or recreation area primarily for day-use activities. The central location of this site with respect to surrounding population centers and excellent access add materially to the value of this site for public use.
Estimated Annual Visitation	1,500,000
Acreage Requirement	3,000 acres
Cost of Physical Improvements	$6,000,000


FRENCH CREEK
X 819
800
700
600
500
400
300
400
500
600
636 X
600
500
400
500
500
100
100
23
Reading 20 miles
Lancaster 32 miles
Wilmington 35 miles
N.Y.
Pa.
N.Y.
N.J.
Easton
FRENCH CREEK AREA
Trenton
Philadelphia
Pa.
Md.
Del.

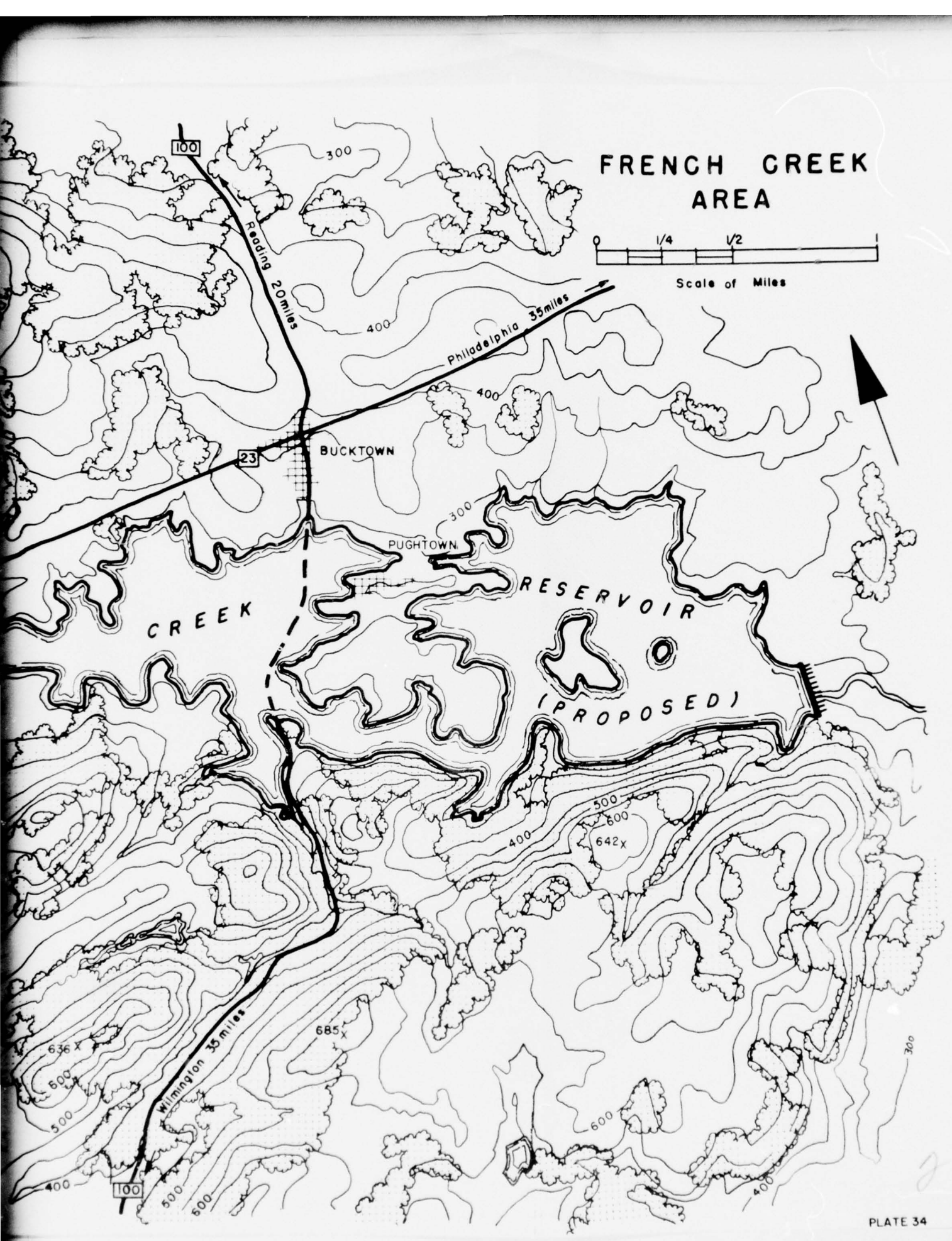

FRENCH CREEK AREA
0
1/4
1/2
1
Scale of Miles
100
Reading 20miles
Philadelphia 35miles
23
BUCKTOWN
PUGHTOWN
CREEK
RESERVOIR
(PROPOSED)
300
400
500
600
642x
685x
636x
Wilmington 35 miles
100

PLATE 34

HAYCOCK MOUNTAIN AREA (Bucks County)
Proposed Tohickon Reservoir Project

Location The Haycock Mountain Area is 31 miles northeast of Philadelphia and 16 miles southeast of Allentown-Bethlehem. U.S. Route 611 provides access from Philadelphia, and State Routes provide access from the Allentown-Bethlehem Region.

This area is advantageously located with respect to population centers. Day-use driving time and distance would include such metropolitan regions as Philadelphia, Allentown-Bethlehem, and Trenton with more than 5 million residents in their combined populations.

Recreation Resources The nucleus of the Haycock Mountain area is the proposed Tohickon Reservoir with its 1,500 surface acres of water and 20 miles of shoreline. A narrow arm of the reservoir would project up Haycock Creek for a distance of 2 miles. The northwest shore would be irregular with numerous bays, necks and points, while the southeast shore would be comparatively smooth.

The topography of the area is dominated by Haycock Mountain which rises to an elevation of 960 feet. The remainder of the land surrounding the reservoir is predominately low rolling hills. The shorelands slope gently to the waters edge except in the vicinity

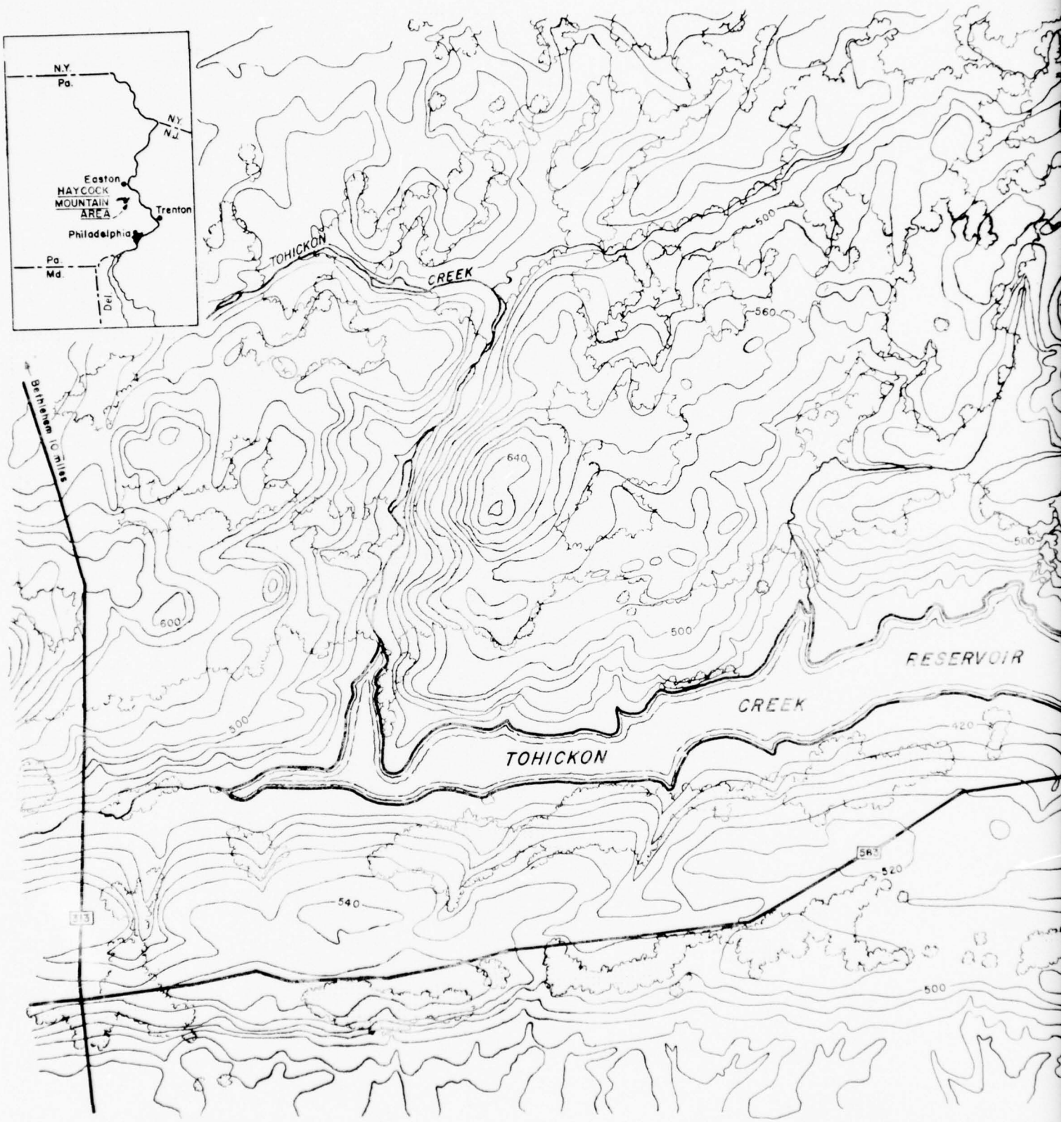


View upstream through the proposed reservoir site.

of the dam. The terrain is well suited for intensive nonurban recreation use and development.

Good forest cover is found on the northwest side while the southeast side is somewhat sparce of good cover. The lands immediately adjacent to the reservoir are for the greater part open.

Recommended Purpose and Uses	The Haycock Mountain Area is recommended for preservation and development as a State park or recreation area. The site is adequate for the development of appropriate facilities to accommodate large visitor loads for day outings as well as weekend and vacation use. Day-use activities would include swimming, boating, fishing, and picnicking. Family and group camping should prove to be popular activities.
Estimated Annual Visitation	1,000,000
Acreage Requirement	9,000 acres
Cost of Physical Improvement	$5,000,000


N.Y.
Pa.
N.Y.
N.J.
Easton
HAYCOCK
MOUNTAIN
AREA
Trenton
Philadelphia
Pa.
Md.
Del.
TOHICKON
CREEK
Bethlehem 10 miles
500
560
640
600
500
500
500
RESERVOIR
CREEK
TOHICKON
420
563
520
540
313
500

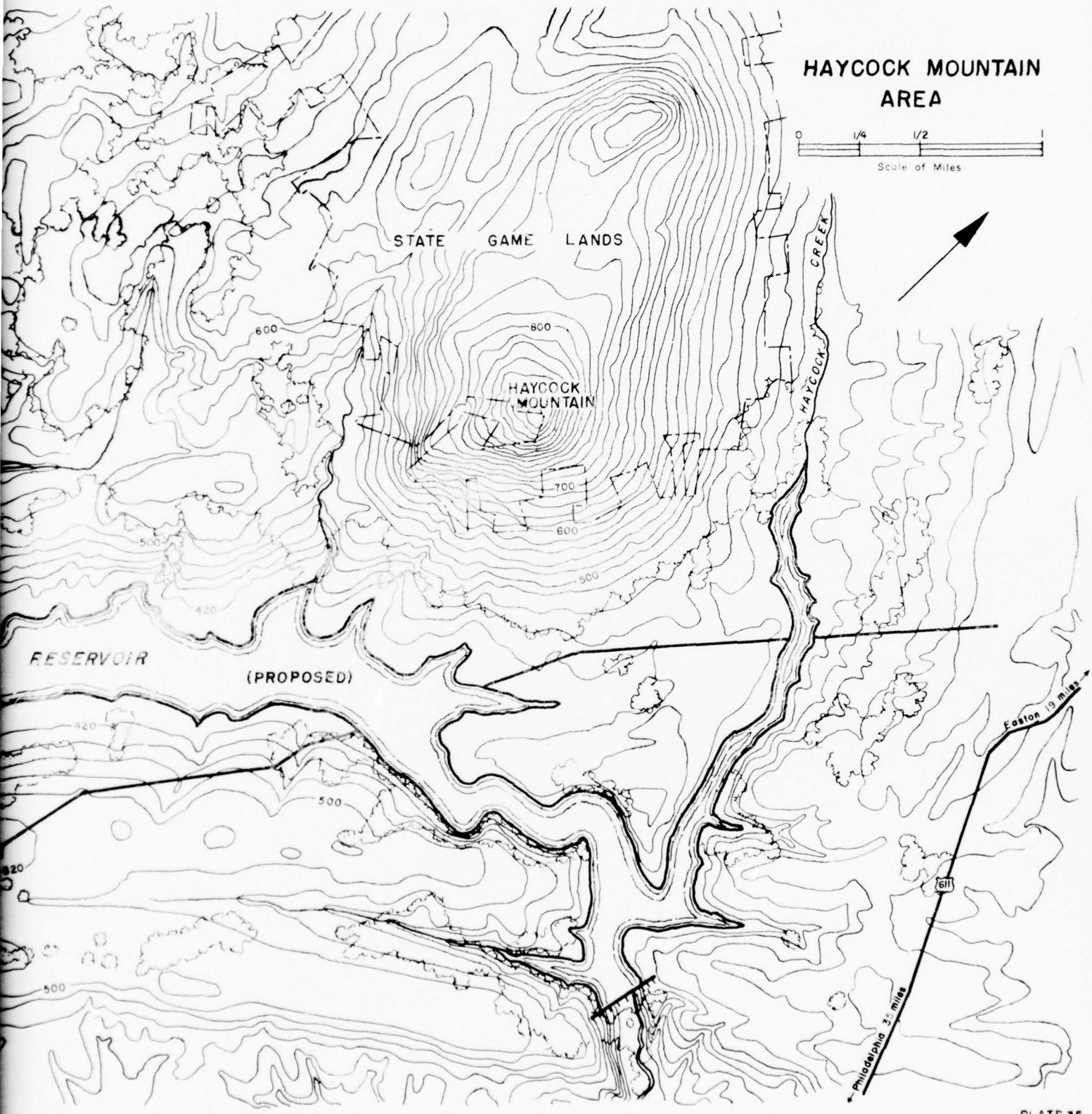

HAYCOCK MOUNTAIN AREA
0 1/4 1/2 1
Scale of Miles
STATE GAME LANDS
HAYCOCK MOUNTAIN
HAYCOCK CREEK
800
600
700
500
420
RESERVOIR
(PROPOSED)
Easton 19 miles
611
Philadelphia 35 miles

PLATE 35

INDIAN HILLS AREA (Carbon County)
Proposed Beltzville Reservoir Project

Location The Indian Hills Area is 5 miles northeast of Lehighton and 15 miles northwest of Allentown-Bethlehem. This location is favorable with respect to the population centers which it would serve. The Allentown-Bethlehem-Easton Metropolitan Region, Hazelton and Stroudsburg are located within 25 miles of the site. The population within day-use driving distance would exceed 1 million.

A network of State and U.S. Highways and the Northeast Extension of the Pennsylvania Turnpike provide excellent access to the site. The Mahoning Valley Interchange of the Turnpike is 2 miles west of the area.

Recreation Resources The principal recreation attraction of this area would be the recreation water created by a proposed dam in Pohopoco Creek. The impoundment would have a surface area of 800 acres. Its total length would be 5 miles and its average width would be approximately 1,500 feet. The shoreline would be fairly regular but containing several bays and points.

The surrounding topography varies from a gentle slope on the north shore to steep hillsides on the south shore. The north shore



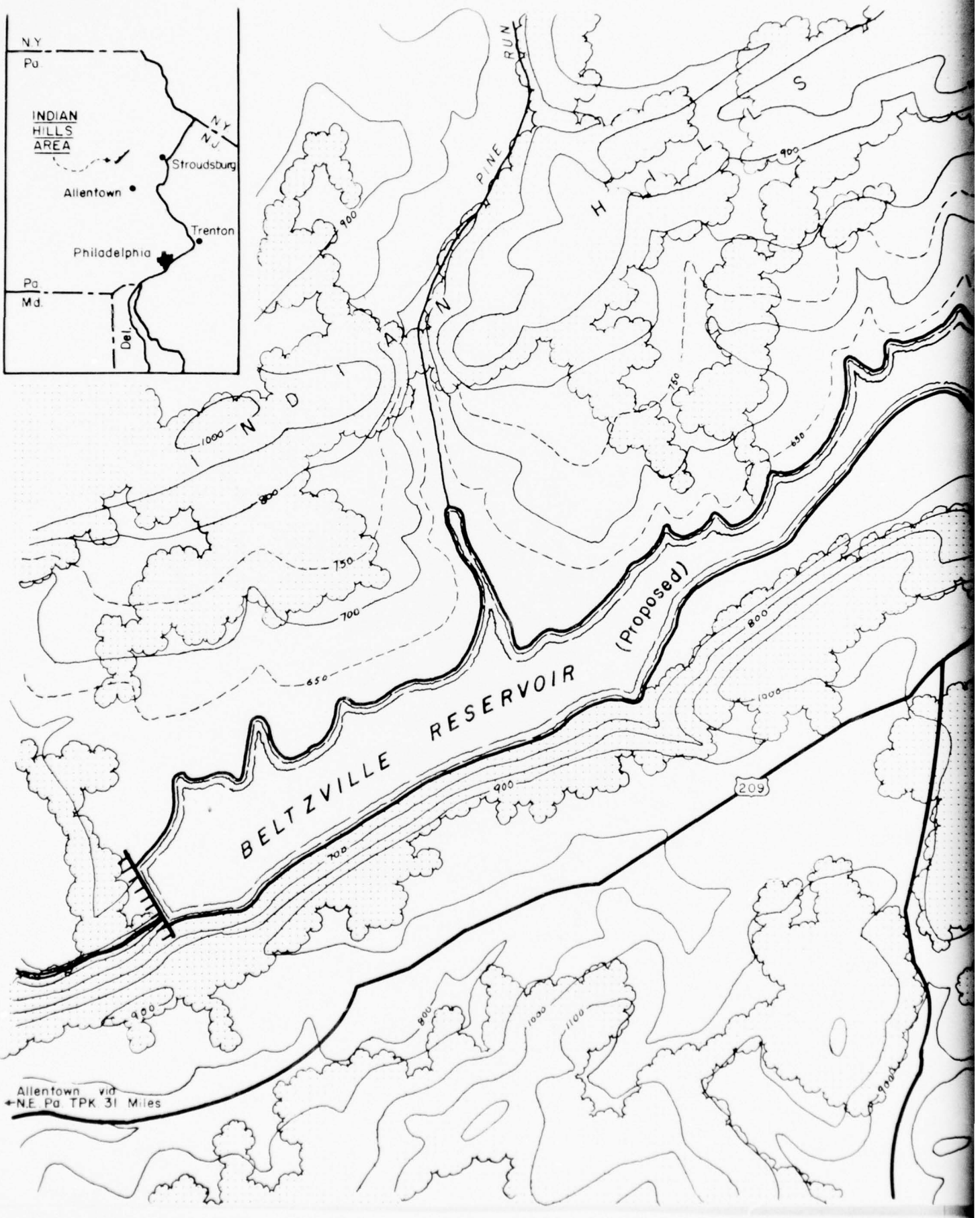
View upstream through the proposed Beltzville Reservoir site.

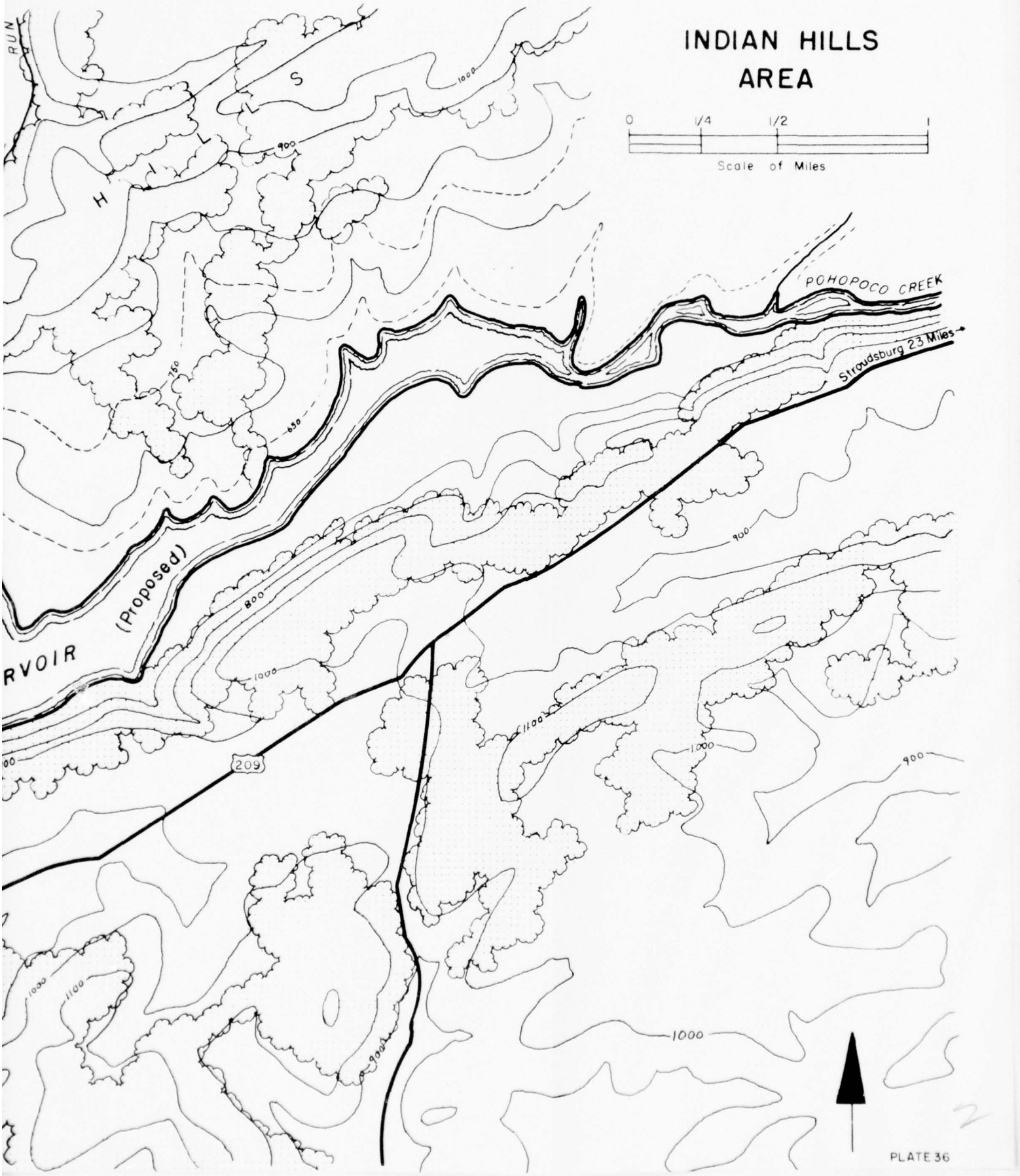
is ideally situated for the placement of recreation developments while the steep wooded hillside on the far shore will provide a desirable scenic feature. There will be one site on the south shore suitable for swimming and/or boating facilities. The entire area could be contained within a single valley with the ridge tops forming the boundaries and affording absolute control of scenes.

Approximately 50 percent of the area is wooded with the remainder being in open or cultivated fields. The ridges are completely wooded and fingers of woodland extend into those areas most desirable for day-use developments.

Recommended Purpose and Uses — It is recommended that the Indian Hills area be preserved and developed as a State park or recreation area primarily for day-use purposes. This site would provide a considerable expanse of recreation water not presently available in this section of the Basin. This area should take a considerable amount of day-use pressure from Hickory Run State Park which is deficient in recreation water for day-use activities. The plan of development should include facilities for swimming, picnicking, boating, fishing, field sports, hiking, and limited camping.

Estimated Annual Visitation	750,000
Acreage Requirement	4,000 acres
Cost of Physical Improvements	$3,000,000


N.Y.
Pa.
INDIAN
HILLS
AREA
N.Y.
N.J.
Stroudsburg
Allentown
Trenton
Philadelphia
Pa.
Md.
Del.
PINE RUN
INDIAN HILLS
BELTZVILLE RESERVOIR (Proposed)
209
Allentown via
N.E. Pa. TPK 31 Miles
900
1000
800
750
700
650
1100


INDIAN HILLS
AREA
0
1/4
1/2
1
Scale of Miles
POHOPOCO CREEK
Stroudsburg 23 Miles
(Proposed)
209
PLATE 36

TULPEHOCKEN CREEK AREA (Berks County)
Proposed Bernville Reservoir Project

Location The Tulpehocken Creek Area is 12 miles northwest of Reading. State Route 83 provides direct access to the site from Reading and U.S. Routes 22 and 422 are 6 miles north and south, respectively, of the site.

The area is favorably located with respect to urban centers which the area would serve. The drawing power radius would extend to Lancaster, Lebanon, Reading, Pottsville, and Shenandoah. The population within day-use travel distance would exceed one-half million.

Recreation Resources The primary recreation resource of this area would be the recreation water area created by the impoundment of Tulpehocken Creek to form the proposed Bernville Reservoir. This reservoir would have a surface area of 2,160 acres and an extremely irregular shoreline with countless bays, necks, and points.

The topography varies from fairly steep low hills on the south shore to rolling farmland on the north shore. The topography and shoreline characteristics are such as to be adaptable for the placement of recreation facilities for a wide variety of day-use activities including all forms of water use.



Low hills and rolling farmland surround the site of the proposed Bernville Reservoir.

Forest cover is not a favorable characteristic of the area; however, reforestation and selective planting could be employed to create a more pleasing environment.

Recommended Purpose and Uses	It is recommended that the Bernville Reservoir Area be preserved and developed as a State park or recreation area primarily for intensive day-use activities such as swimming, boating, fishing, picnicking, and field sports.
Estimated Annual Visitation	1,000,000
Acreage Requirement	6,000 acres
Cost of Physical Improvements	$3,000,000



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DEPT. INT.-NPS- REG. FIVE 6-60

PLATE 37

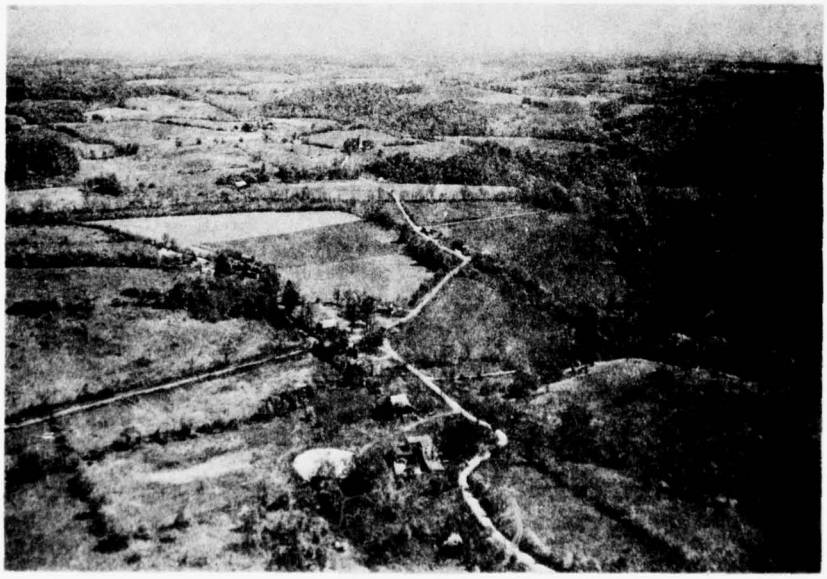
MASON-DIXON INTERSTATE AREA (Chester County)
Proposed Newark Reservoir Project

Location The Pennsylvania portion of the Mason-Dixon Interstate Area is 17 miles southwest of West Chester and 36 miles southwest of Philadelphia. Day-use driving distance from the site would also include Lancaster and Reading, Pennsylvania and Wilmington and Newark, Delaware. Approximately 5 million people reside within the day-use radius of this area.

An existing network of State and U.S. Highways provide access to the general area from the centers of population. The site itself is interlaced with secondary roads connecting with the primary access routes.

Recreation Resources The recreation resources of the area will include approximately 425 acres of recreation water, scenically attractive countryside that is adaptable for recreation activities, woodlands and open fields.

This area includes the Proposed Newark Reservoir Project. The reservoir would have a surface area of 1,060 acres with approximately 40 percent of this in Pennsylvania. The shoreline of this impoundment will be extremely irregular with numerous large bays, fingers of water, necks of land, and promontories overlooking the reservoir.



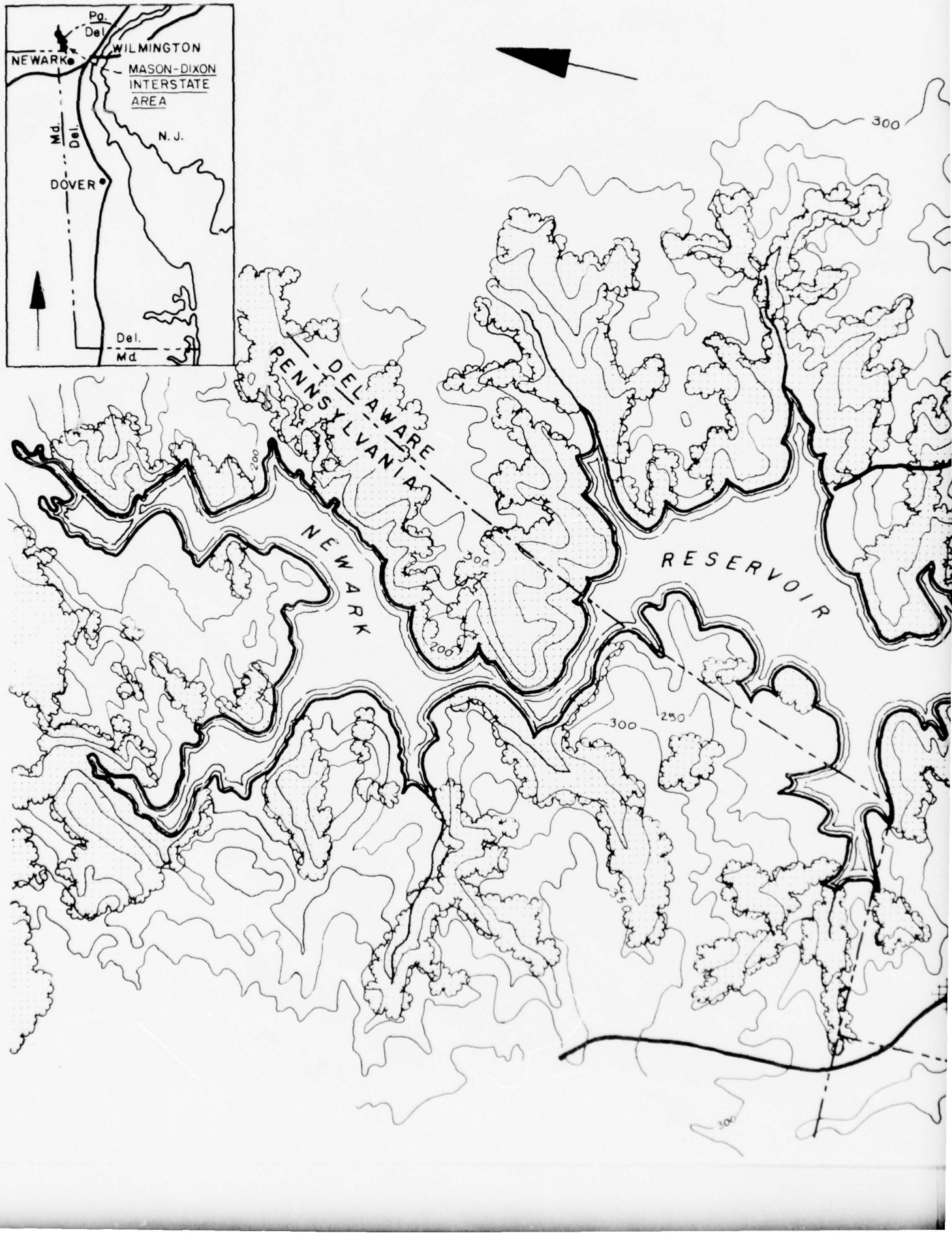
The proposed Newark Reservoir will inundate this valley in Pennsylvania.

The setting in which this reservoir is proposed is very pleasing and ideally situated for nonurban recreation purposes. The topography is varied and suitable for the placement of recreation facilities to accommodate large visitor loads without the effect of crowding. Approximately 50 percent of the area is covered by mixed hardwoods and the distribution of open space throughout the area is favorable.

Recommended Purpose and Uses — The area is recommended for preservation and development as an interstate park or recreation area in cooperation with the State of Delaware. The area will include the tri-state corner of Delaware, Pennsylvania, and Maryland and the point of origin of the Mason-Dixon Line that later served as the dividing line between North and South.

The plan of development should include facilities for swimming, boating, fishing, picnicking, camping, hiking, field sports, group camping and related activities.

Estimated Annual Visitation	250,000
Acreage Requirement	2,400 acres
Cost of Physical Improvements	$1,250,000


Pa.
Del.
WILMINGTON
NEWARK
MASON-DIXON
INTERSTATE
AREA
Md.
Del.
N. J.
DOVER
Del.
Md
DELAWARE
PENNSYLVANIA
NEWARK
RESERVOIR
300
200
250


MASON-DIXON INTERSTATE AREA
0
1/4
1/2
1
Scale of Miles
300
350
300
200
Wilmington 11 miles
MILFORD CROSSROADS
72
RESERVOIR (PROPOSED)
300
250
200
Newark 1mile
300
350
896
MC CLELLANDVILLE
MECHANICSVILLE
250
DELAWARE
MARYLAND
300
PLATE 38

HISTORICAL CONSIDERATIONS

902. The preservation and development of additional historic sites considered to be of State significance in the Pennsylvania portion of the Delaware River Basin are not included in the plan. However, there are at least two features of interest which should be mentioned for possible consideration.

903. The first of these is concerned with the promotion of a national museum of American railroading to be located at Honesdale, Pennsylvania. In view of the significance of railroads in the development of the United States it seems appropriate to commemorate this great industry at its point of origin. Here, in 1829 was operated the first locomotive to run on rails in the United States. This museum would be a private enterprise contributed to by the various railroad companies for the display of railroad artifacts,and where the story of the development of the railroad industry could be told.

904. A second industrial museum located in the anthracite coal region, possibly at Hazelton, Pennsylvania, is suggested to depict the history of mining and quarrying in Eastern Pennsylvania. This would be a private enterprise supported by the industries concerned.

PHASE TWO

905. The following described recreation land reserves are recommended for acquisition as a part of PHASE ONE and held for development after 1980.

PROPOSED RECREATION LAND RESERVES

Shohola Falls (Wayne County)

906. Approximately 12,000 acres of land in the vicinity of Shohola Falls is now owned by the State and administered by the Pennsylvania Game Commission as State Game Land. The site includes a washed-out lake, large marsh, picturesque waterfalls, deep gorge of unusual interest, excellent topography,and good forest cover of mixed hardwoods and hemlock. The over-all characteristics of the area identify it as being admirably suited for park and recreation purposes. Here is an excellent opportunity for joint action to create a multi-purpose nonurban recreation area of outstanding value.

Proposed Evansburg Reservoir Project (Montgomery County)

907. This area is located in Montgomery County, 22 miles northwest from Philadelphia and 27 miles east of Reading. Access to the site is provided by the Northeast Extension of the Pennsylvania Turnpike and U.S. Route 422.

908. A proposed water control structure in Skippack Creek would create an impoundment of 1,200 surface acres. The topography of the land surrounding the proposed reservoir varies from steep, near the dam site, to rolling with an exceptional amount of usable area. Woodland covers approximately 25 percent of the site.

909. This area would be particularly adaptable for such activities as swimming, boating, fishing, picnicking, hiking, field sports, nature study, and group camping.

Proposed Maiden Creek Reservoir Project (Berks County)

910. The system of reservoir projects proposed for the Delaware River Basin includes a site on Maiden Creek 10 miles north of Reading. The reservoir will have a surface area of 2,350 acres, and an extremely irregular shoreline with numerous necks and bays separated by promontories overlooking the reservoir.

911. The terrain surrounding the reservoir site is hilly, many with gentle slopes and flat-tops. Areas suitable for large scale developments for day-use activities are available,but not in proportion to the reservoir area. A significant use of the area would be camping for family units and organized groups.

Warner Lakes (Bucks County)

912. Warner Lakes are adjacent to the Delaware River, 10 miles northeast of the Philadelphia city line.

913. The site contains approximately 3,200 acres, including 1,400 acres of water. These lakes were created as the result of dredging operations to obtain gravel. The land surrounding the water bodies is flat and generally under cultivation. Turkey Hill, an elevation of 80 feet is of interest to local botonists for its unusual flora. Approximately 5 percent of the area is wooded.

914. These lakes would provide excellent opportunities for boating, particularly sailing, presently not available, except in the Delaware River. Swimming, picnicking, fishing, and field sport facilities could be provided for a fully developed day-use area.

Pennsylvania Department of Forests and Waters
Proposed Reservoir WA-5A (Chester County)

915. This area is located on the West Branch of Brandywine Creek, 8 miles north of Downingtown, and 15 and 40 miles respectively from West Chester and Philadelphia. The site is served by the Pennsylvania Turnpike, U.S. Routes 30 and 322.

916. This site will contain a reservoir of 175 surface acres and 5.5 miles of shoreline. The reservoir plan of operation provides for a fixed water level except during periods of severe drought. Releases will be made from the proposed reservoir WA-7, located immediately upstream. The topography of the land surrounding the proposed reservoir is readily adaptable to the placement of recreation facilities.

917. This area could be developed as an extension and enlargement of the proposed Baron Hill development as proposed in Phase One of this plan.

Proposed Trexler Reservoir Project (Lehigh County)

918. This site includes the proposed Trexler Reservoir located 10 miles west of Allentown-Bethlehem, adjacent to the Trexler Game Preserve. U.S. Route 309 and State highways provide access to the area.

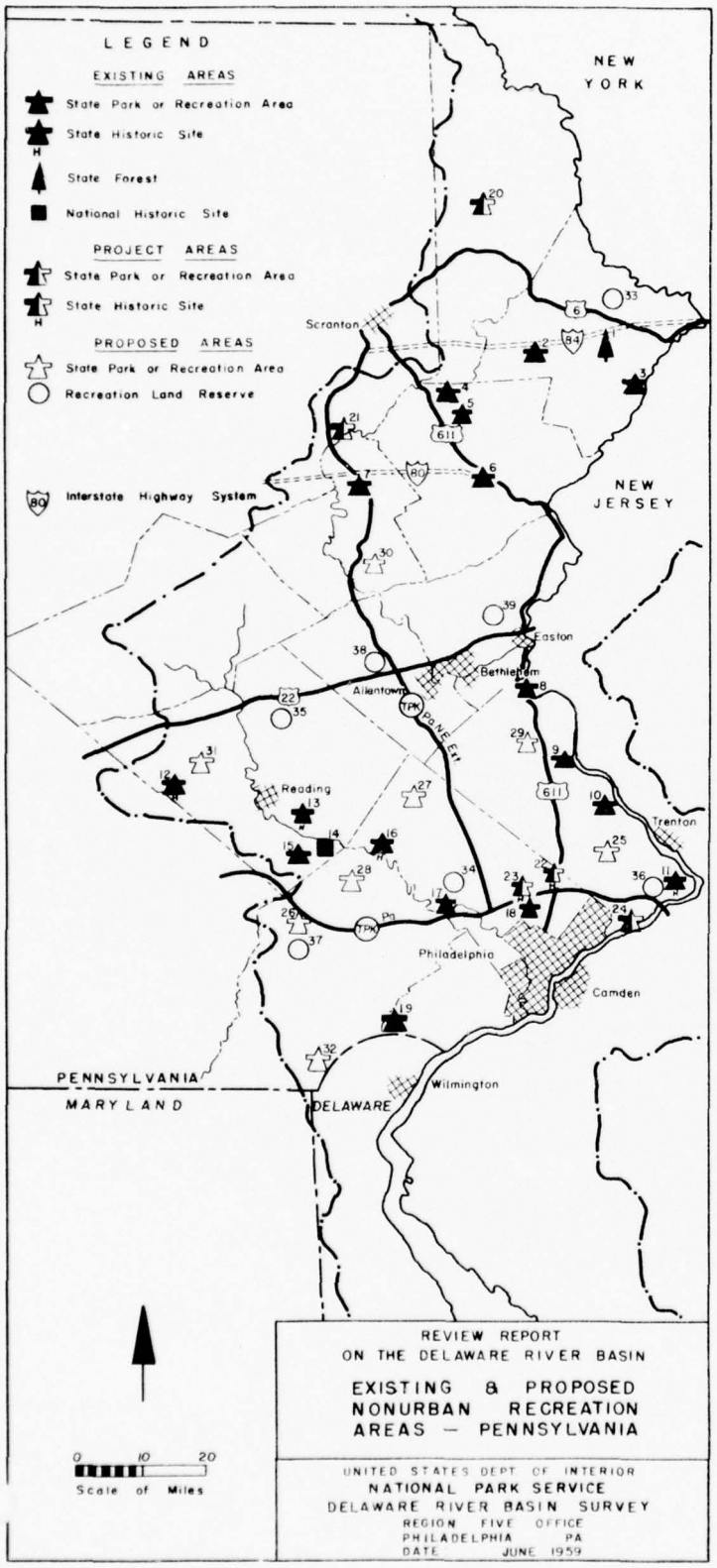
919. The principal recreation resource of this site would be the reservoir of 850 surface acres created by the damming of Jordan Creek. This body of water would have long serpentine fingers with irregular shorelines containing numerous bays, points, necks. The surrounding lands are generally devoted to agriculture, and are for the most part, open. Woodlands are confined to steep hillsides and stream courses. Reforestation and selective planting could be employed to recreate a more desirable setting.

920. The site would be most useful as a day-use area for swimming, fishing, boating, and picnicking.

Jacobsburg Tract (Northampton County)

921. The Department of Forests and Waters has indicated an interest in acquiring approximately 500 acres of land known as the Jacobsburg Tract in Northampton County, 7 miles northwest of Easton. This tract is to be held as a recreation land reserve and used as the nucleus for an eventual State Park Development.

922. The recreation resources of the Tract include Bushkill Creek and several of its tributaries, varied topography that offers scenic areas and adequate usable space, and interesting and diversified flora and fauna. Most of the tract is wooded and generally suited for nonurban purposes.



REVIEW REPORT
ON THE DELAWARE RIVER BASIN

EXISTING & PROPOSED
NONURBAN RECREATION
AREAS — PENNSYLVANIA

UNITED STATES DEPT. OF INTERIOR
NATIONAL PARK SERVICE
DELAWARE RIVER BASIN SURVEY
REGION FIVE OFFICE
PHILADELPHIA PA
DATE JUNE 1959

PLATE 39

EXISTING NONURBAN RECREATION AREAS

1 Delaware State Forest
2 Promised Land State Park
3 George W. Childs State Park
4 Gouldsboro State Park
5 Tobyhanna State Park
6 Big Pocono State Park
7 Hickory Run State Park
8 Roosevelt State Park
9 Ralph Stover State Park
10 Washington Crossing State Park
11 Pennsbury Manor State Historic Site
12 Conrad Weiser Memorial Park
13 Daniel Boone Homestead State Historic Site
14 Hopewell Village National Historic Site
15 French Creek State Park
16 Pottsgrove State Historic Site
17 Valley Forge State Park
18 Fort Washington State Park
19 Brandywine Battlefield State Park

NONURBAN RECREATION PROJECT AREAS

20 Prompton Reservoir State Park
21 Bear Creek Reservoir Access
22 Graeme Park State Historic Site
23 Hope Lodge State Historic Site
24 Logan Estate State Park

PROPOSED NONURBAN RECREATION AREAS

25 Newtown Reservoir
26 Baron Hills
27 Green Lane
28 French Creek
29 Haycock Mountain
30 Indian Hills
31 Tulpehocken Creek
32 Mason-Dixon Interstate

RECREATION LAND RESERVES

33 Shohola Falls
34 Proposed Evansburg Reservoir Project
35 Proposed Maiden Creek Reservoir Project
36 Warner Lakes
37 Proposed Pennsylvania Department of Forest and Waters Reservoir WA-5A
38 Proposed Trexler Reservoir Project
39 Jacobsburg Tract

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HISTORICAL SUPPLEMENT

INVENTORY OF HISTORICAL SITES AND STRUCTURES
DELAWARE RIVER BASIN

The greater number of sites listed fall within the periods of English Colonization and the War of American Independence. However, the appearance of one or more sites in the majority of themes indicates that in general, public and private historical institutions are beginning to recognize the need of presenting a well-rounded historical picture for the benefit of the public. It must be pointed out that not all existing sites and structures possessing interesting associations or architectural merit are included in this list. This is particularly true of the many churches and meetinghouses that are interesting in themselves but possess no outstanding historical associations.

Houses associated with important personages are, for the most part, listed under the theme with which that individual is associated, as exemplified by the Daniel Boone Homestead, which appears under Theme VI, The Advance to the Frontier to 1830.

The same logic may be applied to Fort Delaware. The Fort is best known for its role as a prison for Confederate troops during the War Between the States and is so listed under Theme X.

In recent years, there has been a tendency to develop sites concerned with the economic and social life of the Basin. The Hagley Museum and Winterthur near Wilmington, Delaware, are excellent examples of this healthy trend to fulfill the void that exists in these categories.

The majority of historic sites in the Basin are under the care of various governmental agencies. However, there are a considerable number controlled by private organizations.

HISTORIC SITES AND STRUCTURES BY THEMES

I. SPANISH EXPLORATION AND SETTLEMENT
None

II. FRENCH EXPLORATION AND SETTLEMENT
None

III. DUTCH AND SWEDISH COLONIAL SETTLEMENTS

1. Swedish Hewn Timber House, Hancock's Bridge, N.J. The home was probably built about 1720 by the descendents of the early Swedes of Delaware. State Property.

2. Governor Printz Park, Essington, Pa. (archaeological site). Location of Printzhof, capital of the Swedish settlement, 1643. Site of the first permanent settlement in present Pennsylvania. State Property.

3. Holy Trinity (Old Swedes) Church, Wilmington, Del. Begun in 1698, it is a symbol of the contribution made by Swedish colonial society to the permanent settlement and early cultural development of the Eastern Seaboard. Important example of Swedish colonial institutional architecture. Church property.

4. Site of Fort Christina, Wilmington, Del. First permanent settlement in the Delaware Valley (1638). Most representative of the Swedish colonial origin in America. Scene of the final surrender of Swedish sovereignty in America. State property.

5. Lower Swedish Cabin, Upper Darby Township, Pa. Early log structure build (c.1650) by Swedish settlers. The Swedes introduced the log cabin in America that became so popular on the frontier. Owned by Upper Darby Township.

6. Zwaanendael Museum, Lewes, Del. Adaptation of part of the ancient Town Hall at Hoorn, Holland. Erected to commemorate the 300th anniversary of the settlement of the area by the Dutch in 1631. State owned.

IV. ENGLISH COLONIZATION TO 1700

1. Pennsbury Manor, Falls Township, Bucks County, Pa. Reproduction of William Penn's home along the Delaware. State property.

2. Caleb Pusey House, Upland, Pa. Oldest intact English-built house in Pennsylvania (1683). Private property.

V. DEVELOPMENT OF THE ENGLISH COLONIES, 1700-1775

1. Conrad Weiser Memorial Park, Womelsdorf, Pa. Home of Conrad Weiser, pioneer, Indian interpreter and treaty maker. He lived, died and is buried on this property. State property.

2. Hope Lodge, Fort Washington, Pa. A fine example of early Georgian architecture (1723). Headquarters of General Nathaniel Greene after the Battle of Germantown. State property.

3. Keith House, Horsham, Pa. An architecturally significant stone house built in 1722 by Sir William Keith, Lt. Governor of Pennsylvania, 1717-1726. State property.

4. The 1704 House, Dilworthtown, Pa. Restoration of an early colonial home. Owned by Chester County Historical Society.

5. Troxell-Steckel House. Egypt, Pa. Built of stone in 1756 and restored in 1943 by the Lehigh County Historical Society. Owned by the Society.

6. Whitefield House, Nazareth, Pa. Built 1740-1755. Begun by George Whitefield (began second phase of the Great Awakening religious

revivals in Philadelphia). Purchased by Moravians 1741. Place of worship and home of the Clergy. In 1749 it became a nursery for the children of the church. Later a Theological Seminary and Missionary Home. Property of Moravian Historical Society.

7. Augustus Lutheran Church, Trappe, Pa. The oldest unchanged Lutheran Church in America. Built by Dr. Henry Melchoir Muhlenberg in 1743, Church property.

8. Courthouse, Chester, Pa. Georgian colonial design. Built 1724. Oldest public building in continuous use in the United States Headquarters of Delaware County Historical Society.

9. Morton Homestead, Prospect Park, Pa. A unique Swedish log and stone structure, believed to have been built about 1654. A local tradition holds that John Morton, signer of the Declaration of Independence, was born here. State property.

10. Old Barracks, Trenton, N.J. Restoration and reconstruction of one of the barracks erected during French and Indian War to house colonial troops. Architecture is an adaptation of early Georgian colonial style to a military building. State property administered by the Old Barracks Association.

11. Alexander Grant House, Salem, N.J. Typical South Jersey brick townhouse (1721). Headquarters of Salem County Historical Society.

12. Cooper-Cope House, Camden, N.J. Perhaps the oldest dwelling in the city. City property.

13. First Presbyterian Church, Wilmington, Del. Built 1740. Now the property of the Society of the Colonial Dames of America in the State of Delaware, and rebuilt by them in 1918.

14. Morton Mortonson House, Norwood, Pa. Early Swedish brick house built prior to 1687. City property.

15. Pomona Hall, Camden N.J. Early part of 1726; later section 1788 that typifies post Revolutionary style. Property of Camden County Historical Sociery.

16. Thomas Revel House, Burlington, N.J. Probably the oldest house in Burlington (1685). Property of Colonial Burlington Society.

17. Wall-Shoemaker House, Ogontz, Cheltenham Township, Pa. Place of organization of Abington Friends Meeting 1685. Place of the first religious meeting in this area. Township property.

18. William Trent House, Trenton, N.J. William Trent built house in 1719. Excellent structure and well furnished. Trenton derived its name from Trent. City property.

19. Abraham Van Campen House, Calno, N.J. Built along Old Mine Road about 1725. This fort-like house was headquarters for the Dutch settlers on the upper Delaware River during the Colonial Indian Wars. Private property.

20. Christ Episcopal Church, Laurel, Del. Located on Broad Creek (1771). Noted for its original interior woodwork. Building has never been painted inside or out. Church property.

21. Prince George's Chapel, Dagsboro, Del. Erected 1757. Interior preserved almost entirely in original condition. Pine has never been painted. Church property.

22. Barrett's Chapel, Frederica, Del. Erected in 1780. Early seat of the Methodist Church in America. Church property.

23. Coffee Run Cemetery, 2-miles south of Hockessin on Route 41, Del. Believed to be the first Roman Catholic burial ground in Delaware and site of St. Mary's Church, the first Roman Catholic Church in Delaware. Private property.

24. Welsh Tract Baptist Church, Newark, Del. Erected in 1746. Oldest primitive Baptist Church in America. Church property.

25. Old St. Mary's Church, Burlington, N.J. Oldest Episcopal Church building in the State (1703). Church property.

26. Broad Street Presbyterian Church, Bridgeton, N.J. Built (1792) with funds obtained by a lottery authorized by the State Legislature. Outstanding example of Georgian architecture. Church property.

27. Old New Castle, Delaware. Colonial capital, state capital, court town, market town, seaport, describes Old New Castle. On or near the Green is a significant group of buildings that expresses the life of the old town.

Old Dutch House. Built prior to 1704. Completely furnished with very early Dutch pieces. Excellent example of life at the end of the 17th century in colonial America. Owned by New Castle Historical Society.

Old Presbyterian Church. Erected in 1707. This church was one of seven that organized the first presbytery in America. Church property.

The Court House. Original Colonial Capitol and first State House of Delaware. The spire on top of the State House was used as the center from which an arc was struck on a 12-mile radius, forming the northern boundary of Delaware. State property.

Amstel House. Historic museum. Colonial home built about 1730. Property of New Castle Historical Society.

Immanuel Church. Mother church of the Episcopal Diocese of Delaware. Founded 1689. Built 1703. Church property.

U.S. Arsenal. Built 1809 and used during the War of 1812 and Mexican War. Town property.

Town Hall. Built by the Trustees of New Castle Common about 1823. Town property.

28. Odessa, Delaware. Colonial village and seaport.

David Wilson House. Excellent Georgian colonial house built 1769 for David Wilson, a prosperous merchant and member of the Society of Friends. First free library in Delaware and the only one for 47 years. Adminstered by Corbit Library.

Old Drawyers Presbyterian Church. Built 1773. First congregation 1708. Cared for by the Friends of Old Drawyers.

29. Dover, Delaware. Capital of the First State since 1777.

Old State House. Built 1722 as Court House of Kent County. Since 1777, Capitol of Delaware, used by both state and county until 1873 when county relinquished its rights. Second oldest state house in the United States, still in use as a State house. State property.

Ridgely House. Built 1728 by Thomas Parke. Purchased by Charles Ridgely in 1767 and the Ridgely family still occupies it. The Ridgelys have been a prominent Delaware family for many years. Private property.

Christ Episcopal Church. Erected 1734. Monument to Caesar Rodney in cemetery. Church property.

30. Bethlehem, Pennsylvania. Headquarters of the Moravian Church and home of Moravian College. The structures listed below are grouped together and represent much of the social history of the Moravians.

Central Moravian Church. Erected 1803-1806 by the Moravian brethren. The largest church in Pennsylvania at the time of its completion.

Old Chapel. Place of worship 1751-1806.

Brothers' House. Used as a military hospital during the American Revolution. Now it is Colonial Hall of the Moravian College for Women.

Bell House. Erected 1745 by the Moravians. First used as a family house. Four years later it became a seminary for girls.

Widow's House. Erected 1768. Used since 1823 as a home for the widows of Moravian ministers.

Sister's House. Erected 1742. Occupied by the unmarried women after 1748.

Gemein Haus. Log house 1741. First house of worship and second structure erected in Bethlehem.

VI. THE WAR FOR AMERICAN INDEPENDENCE

1. Brandywine Battlefield Park, Chadds Ford, Pa. Washington's Headquarters - reconstruction. Lafayette's Headquarters - restoration. Important battle (1777) in the Revolution. American troops under Washington attempted unsuccessfully to halt the British advance to Philadelphia. State property.

2. George Taylor House, Catasauqua, Pa. Home of one of the signers of the Declaration of Independence. Property of Lehigh County Historical Society. George Taylor House, Easton, Pa. maintained by Daughters of the American Revolution.

3. Hancock House, Hancock's Bridge, N.J. On March 21, 1778, a party of patriots was surprised and massacred in the house of Judge William Hancock by the British. State property.

4. John Dickinson Mansion, near Dover Air Force Base, Dover, Del. Home of the "Penman of the Revolution". Drafted the Articles of Confederation. State property.

5. Minisink Battlefield, Minisink Ford, N.Y. Site of battle between Indians under Joseph Brant and frontiersmen during the Revolution (1779) to divert attention from the Sullivan-Clinton expedition against another Indian group. Brant won only after a desperate struggle. Property of Sullivan County.

6. Pottsgrove Manor, Pottstown, Pa. Home of John Potts, Colonial ironmaster and founder of Pottstown. Washington's Headquarters, September 1777. State property.

7. Red Bank Battlefield Park, National Park, N.J. Ann Whitall House - 1748. Fort Mercer was constructed here in 1777 by Rhode Island volunteers as part of the Delaware River defenses. Before it was completed it was attacked by 2,000 Hessians who were repulsed with heavy loss. It was finally abandoned by the Americans. U.S. property but administered by Gloucester County Historical Society.

8. Valley Forge State Park, Valley Forge, Pa. Site of the encampment of the Continental Army during the winter of 1777-78.

Deborah Hewes (Isaac Potts) House. Used by Washington as his headquarters during the terrible winter at Valley Forge.

Old Camp Schoolhouse. School building erected in 1705 by William Penn's daughter, Letitia. Used as hospital during 1777-78 encampment. State property.

9. Washington Crossing State Park, Washington Crossing, N.J. Site of the landing of the Continental troops on their way to the Battle of Trenton.

McKonkey House. Tavern and Ferryhouse. Washington spent the night here prior to the Battle of Trenton. State property.

10. Washington Crossing State Park, Washington Crossing, Pa. Commemorates the historic crossing of the Delaware River by Washington and his army on Christmas night 1776 prior to the Battle of Trenton.

Thompson-Neely House. Oldest section built 1702. Just prior to Battle of Trenton it served as headquarters for Lord Stirling (American Army).

Taylor House - 1812. Serves as headquarters for Washington Crossing Park Commission.

Tavern Ferry House. Present structure superimposed on the original structure adjacent to the ferry that played a significant role in Washington's Cossing of the Delaware. State property.

11. "Waynesborough", Paoli, Pa. Birthplace of General Anthony Wayne. Typical example of a Georgian manor house of Eastern Pennsylvania. Private property.

12. Battle of Cooch's Bridge. Cooch's Bridge, Del. Only battle of the Revolution on Delaware soil and claimed (along with others) to have been the first in which the Stars and Stripes were carried. Private property.

13. Independence National Historical Park, Philadelphia, Pa. Here were adopted the Declaration of Independence, the Articles of Confederation, and the Federal Constitution of 1787. The park contains Independence Hall, Carpenters' Hall, Christ Church, First and Second Banks of the United States, the Philadelphia Exchange and other historic sites and buildings. Administered by the National Park Service.

14. Indian King Tavern, Haddonfield, N.J. The State Legislature frequently met here. The Council of Safety for New Jersey was organized here March 18, 1777. A bill was passed substituting the word "State" for "Colony" in all State papers, and the Great Seal of New Jersey was received and adopted. State property.

15. Trenton Battle Monument, Trenton, N.J. Marks the site of the main American gun emplacement at the Battle of Trenton, December 26, 1776. State property.

16. Fort Mifflin, Philadelphia, Pa. Part of the defenses of Philadelphia. Scene of a tremendous naval and land bombardment by the British in November 1777 that finally caused the Americans to abandon the fort and opened the Delaware River to the British. U.S. property.

17. Fort Washington State Park, Fort Washington, Pa. Camping place of Continental Army, 1777. State property.

18. Paoli Massacre, Malvern, Pa. Scene of the British attack on American forces under General Anthony Wayne. Called a "massacre" because of the ruthlessness of the British in using the bayonet and their refusal to give quarter. City owned.

19. Decker's Fort, Port Jervis, N. Y. Stone house used as a fort to protect the frontier and its defenders during the American Revolution. Private property.

20. Isaac Van Campen Inn, Shapnack, N.J. One of the few Dutch colonial houses in New Jersey. John Adams, who travelled the Old Mine Road en route to attend Congress, reportedly stopped here. Private property.

VII. POLITICAL AND MILITARY AFFAIRS, 1783-1830

1. David Townsend House, West Chester, Pa. House museum. Property of Chester County Historical Society.

2. Heister Mansion, Leinbacks, Pa. Home of Joseph Heister, Revolutionary soldier, Congressman, and Governor of Pennsylvania 1820-1823. Built c. 1750. Now within the Bucks County Prison, Welfare Farm and Sanatorium Lands. County property.

3. Highlands, Whitemarsh, Pa. Large country estate with home dating 1796. Legislation pending for State acquisition.

4. John Lawrence House, Woodbury, N.J. House museum of the Gloucester County Historical Society.

5. Lawrence House, Burlington, N.J. Birthplace of Captain James Lawrence, the celebrated naval hero during the War of 1812, who spoke the immortal words "Don't Give Up the Ship". State property.

6. Old Town Hall, Wilmington, Del. Built 1798. Slight French influence in Georgian colonial style. Home of the Historical Society of Delaware.

7. Richard Wood Mansion, Greenwich, N.J. Headquarters of the Cumberland County Historical Society.

8. Stroud House, Stroudsburg, Pa. Built 1795 by Colonel Jacob Stroud, founder of Stroudsburg. Now used as a community house. City property.

9. Macdonough House, McDonough, Del. Early home of Commodore Thomas Macdonough, hero of Battle of Lake Champlain, 1814. Private property.

10. Somers Mansion, Somers Point, N.J. Built 1720-1730. Home of Atlantic County Historical Society. State property.

VIII. THE ADVANCE TO THE FRONTIER TO 1830

1. Daniel Boone Homestead, Baumstown, Pa. Home built on site of the birthplace of Daniel Boone, the famous frontiersman. State property.

IX. POLITICAL AND MILITARY AFFAIRS, 1830-1865

1. Buena Vista, Hare's Corner, Del. Dutch house completed in 1864 by John M. Clayton, Chief Justice of Delaware, U.S. Senator, and Secretary of State under President Zachary Taylor. Clayton named home for Taylor's victory in the Mexican War. Private property.

2. Haddonfield Historical Society Building, Haddonfield, N.J. Tall, narrow town building, typical of homes of well-to-do burghers of the period (1836). Owned by the Society.

X. THE WAR BETWEEN THE STATES, 1861-1865

1. Fort Delaware State Park, Pea Patch Island, Del. Fort completed in 1859. Housed as many as 12,000 Confederate prisoners at one time. Those who died at the fort are buried in the National Cemetery adjacent to Fort Mott State Park, N.J. State property.

2. Fort Mott State Park, Finns Point, N.J. Within the park are the fortifications that once guarded the river approaches to Philadelphia during the Civil and Spanish-American Wars. State property.

XI. WESTWARD EXPANSION AND THE EXTENSION OF NATIONAL BOUNDARIES, 1830-1898

1. David Wilmot Birthplace, Bethany, Pa. Birthplace of the great Free Soiler and author of the Wilmot Proviso (1846) barring slavery from territory acquired in the Mexican War. Private property.

XII. COMMERCE, INDUSTRY, AND AGRICULTURE TO WITHIN FIFTY YEARS

1. Hagley Museum, Wilmington, Del. Devoted to industrial history of the United States and the DuPont industrial enterprises along Brandywine Creek. Private property.

2. Hopewell Village National Historical Site, Birdsboro, Pa. Restoration of an early American iron-making village that was operated between 1770 and 1883. U.S. property-National Park Service.

3. Oxford Furnace, Oxford, N.J. Built 1741-1742. Supplied cannonballs to American troops during French and Indian, Revolutionary, and Civil Wars. State property.

4. Pahaquarry Copper Mines, Warren County, N.J. Open copper mines were worked, according to tradition, by the Indians in the 15th century and as early as 1660 by the Dutch. Private property.

5. John Fritz House, Londonderry Township, Pa. Birthplace of John Fritz, who introduced the three-high rolls into the Cambria mills, applied the Bessemer process to American practice, and improved the manufacture of armor plate. Private property.

XIII. TRAVEL AND COMMUNICATION

1. Roosevelt State Park, Northampton and Bucks Counties, Pa. A 60-mile segment of the Delaware Division of the Pennsylvania Canal from Easton to Bristol. State property.

2. Old Mine Road, Warren and Sussex Counties, N.J. Built about 1650 to connect Esopus (Kingston), N.Y., on the Hudson River with the Pahaquarry Copper Mines. County and Township roads.

3. Perkiomen Bridge, Collegeville, Pa. One of the oldest bridges still in use in the State (1799, later rebuilt). State property.

4. Roebling Bridge, Minisink Ford, N.Y. Constructed by John A. Roebling, builder of the Brooklyn Bridge, to support the D & H Canal aqueduct by which boats crossed the Delaware River, 1848-98. State property.

XIV. DEVELOPMENT AND CONSERVATION OF NATIONAL RESOURCES TO WITHIN FIFTY YEARS

1. Gray Towers, Milford, Pa. Residence of Gifford Pinchot noted forester, conservationist and Governor of Pennsylvania. Private property.

2. Rothrock House, West Chester, Pa. Home of Joseph T. Rothrock, father of the State Forest idea in Pennsylvania. Pioneered in the development of forest fire control, reforestation, and scientific forestry. Private property.

XV. THE ARTS AND SCIENCES TO WITHIN FIFTY YEARS

1. Clara Barton Schoolhouse, Bordentown, N.J. Built 1739. Used by Clara Barton, founder of the Red Cross, who established one of the first free public schools in this country in 1844. City property.

2. Gilder House, Bordentown, N.J. The Gilders achieved distinction in literature, arts, and science. Richard was editor of The Century; Joseph was editor of The Critic; John, a composer; and William, a geographer and explorer. City property.

3. Mill Grove Farm, Audubon, Pa. Home of the noted naturalist, John James Audubon, after 1804. County property.

4. Trout Hall, Allentown, Pa. Residence of provincial Chief Justice William Allen. Early home of Muhlenberg College. Property of Lehigh County Historical Society.

5. Walt Whitman House, Camden, N.J. The celebrated poet lived here during his last years. State property.

6. Henry Francis Du Pont Winterthur Museum, Winterthur, Del. One of the largest and richest assemblages of American decorative arts ever brought together. Private property.

7. Woodchuck Lodge, Roxbury, N.Y. The home of the naturalist and writer, John Burroughs, during the last years of his life. Private property.

8. Birmingham Octagonal School, Chadds Ford, Pa. Example of a once popular type of school structure. Church property.

9. Bryn Athyn Cathedral, Bryn Athyn, Pa. Center of the Swedenborgian Faith. Noted for its Gothic and Romanesque architecture. Church property.

10. James Fenimore Cooper House, Burlington, N.J. The famous author was born in this house in 1789. Headquarters of Burlington County Historical Society.

11. Mark Sullivan's Home, Avondale, Pa. Birthplace of the celebrated writer, Mark Sullivan. Private property.

XVII. THE UNITED STATES AS A WORLD POWER, 1898

1. The Olympia, Philadelphia, Pa. The flagship of Admiral Dewey during the Spanish-American War. Private property.

ARCHAEOLOGICAL SUPPLEMENT

INVENTORY OF ARCHAEOLOGICAL SITES
DELAWARE RIVER BASIN

The following tabulation of archaeological sites was compiled from published material and personal contacts with various State and private organizations having a basic interest in archaeology.

The National Park Service was specifically directed to concentrate its efforts on the proposed Tocks Island Reservoir site and the archaeological values that might be lost forever as a result of the inundation of this area. These sites are marked by an asterisk (*) in the compilations for New Jersey and Pennsylvania. No basic field research was desired or attempted in this undertaking.

In addition to the proposed Tocks Island Reservoir site, as much of the remainder of the Basin was covered as was possible within the limits of available funds and manpower. The degree of completion of this archaeological site inventory is as follows:

Proposed Tocks Island Reservoir Site - Complete

Delaware - - Complete

New Jersey - Complete for the northern tier of counties in the basin

Pennsylvania - Complete, in that major sources and most obscure ones have been processed.

The following key has been used to identify archaeological sites in the inventory:

V - Village	E - Evidence
C - Camp	Q - Quarry
RS - Rock Shelter	BG - Burial Ground

ARCHAEOLOGICAL SITES - DELAWARE

SITE			
Memomkitonna	V	Delaware River, New Castle Naamans Creek	On Naamans Creek near Claymont near N. Boundary of State; extends towards Chichester Creek

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DELAWARE (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Worth Steel	C	Delaware River	New Castle	Near Claymont; junction of Naamans Creek and Delaware River; on west bank of Delaware River; short distance from Cresson's Fish Weir above high tide
Cresson's Fish Weir	E	Delaware River, Naamans Creek	" "	Near Claymont; inside mouth of Creek; south bank
Arden	RS	Delaware River, Naamans Creek	" "	1-mile W.of Claymont; approx. 50' behind Arden Swimming Pool
Hollyoak	E	Delaware River, Unnamed Creek	" "	Near small stream entering Delaware there
Bellvue	C	Delaware River	" "	Near Bellvue; apparently not on River
Bellvue	E	Delaware River Stoney Creek	" "	Near small stream entering Delaware there
Ammineniapaty	E	Delaware River	" "	Near Edgemoor; adjacent to Gov't wharf; site of DuPont pigment plant
Crane Hook	V	Delaware River, Christina River	" "	From junction of Delaware and Christina Rivers; 1-mile S. along Delaware; near Wilmington Marine Terminal; extends to vicinity of Pigeon Point pier of Reading Railroad
Minquadale	C	Christina River	" "	S. Wilmington; suburban development; 1-mile NE of Pigeon Point
Wilmington	E	Christina River, Shellpot Creek	" "	Near Wilmington; on Creek
Borky Woods	Q	Christina River, Brandywine Creek	" "	Near Ganogue; Irenee DuPont Estate
Indian Cave; Wolf Rock; Wolf Rock Cave	RS	Christina River Brandywine Creek, Beaver Run	" "	On slope E.of road through Beaver Valley to Concord Pike

DELAWARE (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Queominising	V	Christina River, Brandywine Creek	New Castle	In Great Bend of the Brandywine; site partly in Pa.
Hopokohacking	V	Christina River	" "	Site of Wilmington;present Fort Christina Park;"the rocks"
Indian Rocks	E	Christina River, Mill Creek (Formerly Richardson's Run)	" "	W.of Newport Rd.; approx. 200 yds. above site of old Richardson Mill
W. S. Betts Farm	C	Christina River, Mill Creek (?)	" "	Bellemoor suburb of Wilmington;Richardson Park area; W. side of S.Maryland Ave.;9.75 acres; 1-mile S.of city line; between Elmhurst and Hayden Park; house plot 221
"Black Mattie"	C	Christina River, Tributary	" "	1/8 mile NW Betts site; foot of Winston Ave.; adjacent to small brook;on small knoll
Woodcrest	C	Christina River, Mill Creek (?)	" "	S.of Bellemoor;Richardson Park area; 0.25 miles from Betts site; near Conrad High School
Hayden Park	C	Christina River, Mill Creek (?)	" "	Opposite Woodcrest site; E. side of Newport Pike; 1st house S.side Middleborough Rd; site in field between house and Pike
"Ragan" #1	C	Christina River	" "	Directly on W/bank of river between Wilmington and Newport on main line of RR;near signal town "Ragan";N.of tower is site
"Ragan"#2	C	Christina River	" "	0.25 miles upstream from "Ragan" #1; W.bank of river
Folly Pond	C	Christina River	" "	Opposite side of RR tracks from "Ragan" #1 & 2;S.edge of Folly Woods

DELAWARE (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Minquas Plantation	V	Christina River	New Castle	N.side of present Newport
Hog Swamp	V	Christina River	" "	E.bank of Christina River; opposite Clyde Farm Site stretches along bank; 1 knoll opposite mouth of White Clay Creek;another 0.5 miles upstream;extends over main New Castle Highway;here on McDaniel Farm this farm at junction of Christina with None-such Creek
Clyde Farm	V	Christina River, White Clay Creek	" "	Near Stanton & Newport;on flats at junction of Christina and White Clay Creek; mostly along Christina
Unnamed	E	Christina River, White Clay Creek; Mill Creek; Unnamed Tributary	" "	Area S.of Hockessin;possibly juncture of unnamed tributary with Mill Cr.site about 0.5 miles up tributary
Unnamed	E	Christina River White Clay Creek, Mill Creek	" "	Area S.of Hockessin;possibly 0.5 miles S.of town;on Mill Creek -Fred Roser Farm;near Hockessin -Beiderman Farm;near Hockessin
Unnamed	E	Christina River, White Clay Creek, Mill Creek; Unnamed Tributary	" "	Area S.of Hockessin;S.of junction of this tributary with Mill Creek; W.of Route #7
Unnamed	E	Christina River, White Clay Creek, Mill Creek	" "	N.of Hockessin;S.of Junction of this tributary with Mill Creek;W.of Route #7
Hockessin	E	Christina River, White Clay Creek, Mill Creek	" "	Area N.of Hockessin;Mill Creek Hundred;near Pa. line
Hopkins Farm	E	Christina River White Clay Creek	" "	Area N.of Newark;on Mechanicsville,Pleasant Hill Rd;on Cr.

DELAWARE (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Chambers Rock Farm	E	Christina River, White Clay Creek	New Castle	Area N.of Newark;E.side of creek;across BM 128; on Creek
Unnamed	E	Christina River, Unnamed Creek	" "	E.town of Christina;juncture of Routes 273 and 7; 1st road on left to Newport from Christiana; on unnamed Creek
Unnamed	C	Christina River	" "	At or near Cooch's Bridge; SE of Newark
Ledich Farm	E	Christina River Unnamed Creek	" "	General area S.of Newark; on unnamed tributary; 1st stream S.and flowing E.of Persimmon Creek between Chestnut Hill & Iron Hill
Iron Hill	Q	Christina River	" "	S. of Newark
Unnamed	E	Christina River, Unnamed Creek	" "	Area W.of Newark; site directly on tributary
Unnamed	E	Delaware River, Red Lion Creek	" "	Near Delaware City;N.of Rybold both sides of Creek
Armstong	E	Delaware River C & D Canal	" "	NE town of St.Georges; ca. 1-mile on River Rd. (way to Rybold and New Castle);SE Cor. of junction of River Rd. and the Delaware City; US #13 Road
Indian Hole Farm	Q	Delaware River	" "	Near Port Penn;S.of Delaware City;on ridge near Delaware 1-mile N. of farmhouses
Appoquenammy	E	Delaware River, Leipsic River, Duck Creek	Kent	Near mouth of Duck Creek not far from Delaware River
K28	V	Murderkill River	"	E.of and adjacent to Fredrica;E.side of River; on river

DELAWARE (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Killan's Mill Pond	BG	Murderkill River	Kent	Ca.3 miles SE of Felton; S.side of stream where it enters Pond;burial ground E.side of road
Alexander Farm	C	Delaware River Cedar Creek	Sussex	E.of Milford;on Cedar Creek near Ft.Saulsbury;Creek enters Bay at Cedar Beach
Milford	C	Mispillion River	"	Ca. 2 miles E.of Milford;on small tributary flowing W; adjacent to swampy ground
Milford	V	Mispillion River	"	E.of Milford;S.bank of River;directly where river turns N.after flowing E.
Phillips-Robinson-Benson	C	Mispillion River	"	Near Milford;S.bank of river
Slaughter Creek	V	Delaware River Slaughter Creek	"	Ca. 10 miles SE of Milford; on Primehook Neck;center of site 0.5 miles E.on Creek of Primehook School;S.side of Creek;total site from Davis Landing Rd. to Rd. across head of E.marshy area
Draper	V	Delaware River, Slaughter Creek	"	Opposite side of Creek from Slaughter Creek site; i.e. N.side; less 0.5 miles from Primehook School; on Creek; E.of road leading N. to Davis Landing
Jones Farm	C	Delaware River, Slaughter Creek	"	In area of Slaughter Creek Site possibly adjacent to it
Unnamed	E	(Possibly not DRB)	"	Near Georgetown
Ritter	V	Broadkill Creek, Red Mill Creek, Black Oak Gut	"	E.side of E.branch of Mill Creek;occupies 1st high ground S.of marshlands; along Black Oak Gut for 1000 yds.

DELAWARE (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Russel	C	Delaware River, Canary Creek	Sussex	W.of Lewes;on Canary above marsh;N.side of Creek; ca. 0.2 miles W.of Nassau; Pilottown Rd.;ca.1-mile SSW DeVriess Monument on Pilottown Road, Lewes
Derrickson	V	Delaware River Canary Creek	"	W.of Lewes; at bend of rd. leading NE from Nassau to N. of Lewes (the Pilottown Rd.?) site E.of Rd. at bend;on Cr.
Miller-Toms	C	Delaware River, Canary Creek Metcalf's Branch	"	Behind grounds of Lewes School and Fort Miles Station Hospital;bounded on W. by Metcalf's branch;on E. by Lewes H.S. football field
Townsend II	C	Delaware River, Canary Creek	"	S.of Lewes; N.of Rd. between Westcoat Corners and Murray Corners; on Creeks
Townsend I	V	Delaware River, Canary Creek	"	S.of Lewes; ca. 1.5 miles; E. of Murray Corners; not on Creek
Paynter	C	Delaware River, Lewes and Rehoboth Canal	"	Near Lewes; short distance from Moore Shell Heap
Moore Shell Heap	C	Delaware River, Lewes and Rehoboth Canal	"	Ca. 1/2 way between Rehoboth and Lewes; along Canal;E.side of Canal

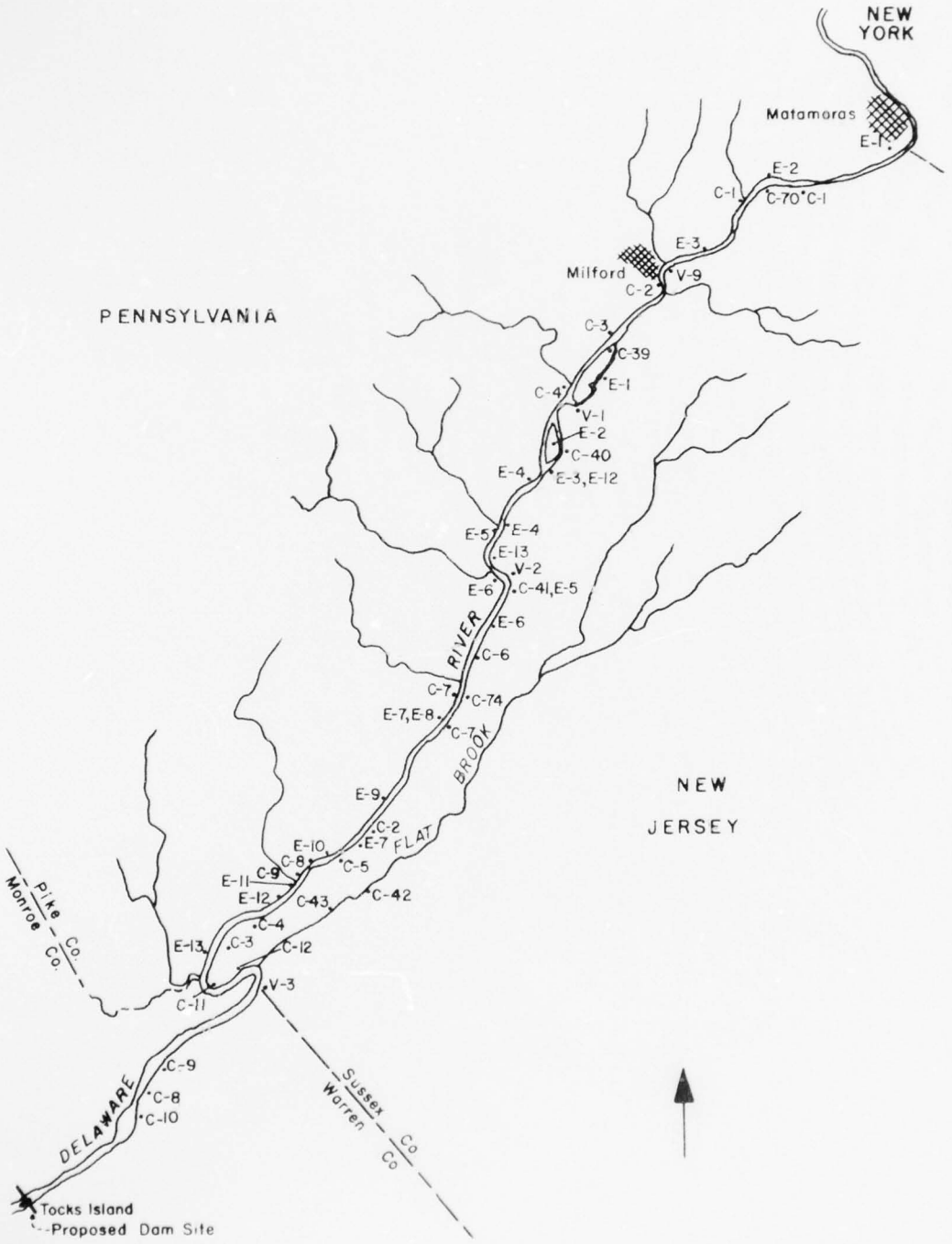
ARCHAEOLOGICAL SITES - NEW JERSEY

Key: * Possible inundation by Tocks Island Reservoir
(2) Number of individual sites
21-14-3-2-5 Identification system used by New Jersey Museum

Minisink Island 21-14-3-2-5 21-14-3-4-3 21-14-3-4-5	*C-39	Delaware River	Sussex	3 locations on the Island;at northern end of island;Island just S.of Milford,Pa.

NEW JERSEY (continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Bell-Philhower 21-14-2-9-2,5	*V-1	Delaware River, Big Binne Kill	Sussex	On bank of Delaware; opposite S.end of Minisink Island; S.of Milford, Pa.
Unnamed 21-14-3-7-3	*E-1	Delaware River, Unnamed Tributary	"	Opposite Minisink Island; N.of unnamed tributary; near junction of it with Delaware River
Namanock Island 21-14-5-3-4	*E-2	Delaware River	"	Less than 1 mile down from Minisink Island; east shore of island
Unnamed 21-14-5-3-2	*C-40	Delaware River	"	On mainland; opposite E.shore of Namanock Island; 1-mile S. Bell-Philhower
Unnamed 21-14-5-3-8	*E-3	Delaware River	"	On mainland; opposite S.end of Namanock Island
Unnamed 21-14-5-5-6 21-14-5-5-8	*E-4	Delaware River	"	Distance 1.5 miles downstream from Namanock Island; four fishing places; particularly Dupuy Farm
Morgan 21-14-8-1-4,5,7,8	*V-2	Delaware River, Skunk Run	"	Just N.of Dingmans Ferry Bridge at mouth of Skunk Run; on Morgan Farm
Unnamed	*C-41	Delaware River	"	Less than 1-mile SE of Dingman Ferry; near brook; high ground
Unnamed	*E-5	Delaware River	"	300 yds. S. of Dingmans Ferry
Unnamed 21-14-8-7-7 21-24-2-1-1	*E-6	Delaware River	"	Approx. 1-mile W.of Bevans; high ridge overlooking river
Haneys Mill #1 21-23-6-8-1, 2,4	*E-7	Delaware River	"	1.5 miles NW Haneys Mill; this on Flatbrook Creek; on Delaware River
Haneys Mill #2 21-23-9-3-2	*C-42	Delaware River Flatbrook Creek	"	Location not precise; on E.bank of Creek



ARCHAEOLOGICAL SITES

PROPOSED TOCKS ISLAND RESERVOIR

DEPT. INT.-NPS-REG. FIVE 6-60

PLATE 40

NEW JERSEY (continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Unnamed (2) 21-23-8-6-7 21-23-8-8	*C-43	Delaware River Flatbrook Creek	Sussex	W.Bank of Flatbrook-ca.2 miles above mouth;two camp sites
Unnamed 21-33-1-1-9 21-33-1-2-7,8	* V-3	Delaware River	"	SW of Flatbrookville-along the River
Unnamed 21-33-2-1-6	C	Delaware River	"	"High up on slope" of Kittatinny Mountain
Merring Farm 21-24-3-3-9	C	Delaware River Flatbrook;Big Flatbrook Creek	"	Near Tuttles Corner-Merring Farm
Hamm Farm 22-21-17-4-7	C	Paulins Kill ? Culvers Pond	"	Near NE end of Culvers Pond
Kay Farm 21-25-1-5-9	C	Paulins Kill ? Culvers Pond	"	Near N.end of Culvers Pond
Kerr Farm 21-25-1-8-2	C	Paulins Kill ? Culvers Pond	"	Just E.of Culvers Gap
Sewage Point 21-25-1-8-8	V	Paulins Kill ? Culvers Pond	"	On Point; location not definte;near Kerr Farm
Lawson Farm 21-25-4-1-7-8	V	Paulins Kill ? Culvers Pond Lake Owassa	"	N.end Lake Owassa;SE of connecting brook to Culvers Pond, high level land
Unnamed 21-24-6-3-5-,6	C	Paulins Kill ? Culvers Pond, Lake Owassa	"	Northern extremity of lake
Unnamed 21-24-6-3-7	C	Paulins Kill ? Culvers Pond, Lake Owassa	"	West shore of lake
Unnamed 21-24-6-2-3	C	Delaware River Flatbrook Creek, Unnamed Tributary	"	Across Kittatinny Mt. from preceding site;location doubtful
Canticaw 21-24-6-8-1 21-24-8-1-4	C	Paulins Kill ? Culvers Pond, Lake Owassa	"	South end of Lake;location not specific

NEW JERSEY (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Morgan Farm 21-25-4-7-1,2,4 21-25-4-7-2	E	Paulins Kill ? Culvers Pond, Lake Owassa	Sussex	E. end of Bear Swamp
L'Hommedieu Farm 21-24-5-9-2	C	Paulins Kill, Swartswood Lake Unnamed Stream; Quick Pond	"	0.5 miles NE Quick Pond; W. bank of brook
Unnamed 21-24-5-8-7	C	Paulins Kill; Swartswood Lake Unnamed Stream Quick Pond	"	West shore of Quick Pond
Mud Pond Area (11)	C	Paulins Kill, Trout Brook, Mud Pond	"	General area around Mud Pond; S.along Trout Brook; often bordering swamps in this area
Garret Pittinger Farm 21-24-8-4-1	V	Paulins Kill, Trout Brook, Mud Pond	"	Few hundred yds. NE of Mud Pond, at foot of Mountain
Upper Swartswood 21-24-7-8-2	RS	Paulins Kill, Trout Brook, Mud Pond	"	Just West of Mud Pond Area 3, 4, 5
Sprout Hill (3)	C	Paulins Kill, Trout Brook,	"	On Sprout Hill; 1/2 way between Mud Pond and Swartswood Lake
Round Pond 21-24-7-4-9	E	Paulins Kill, Trout Brook, Round Pond	"	East end of Round Pond
Long Pond 21-33-3-3-1	C	Delaware River, Van Campens Br.	"	South end of Long Pond
Fairview Lake (Sucker Pond)	E	Paulins Kill, Blairs Creek, Fairview Lake	"	Two fishing places; N.and E. shore of lake
Little Pond (6)	C	Paulins Kill, Swartswood L. Little Pond	"	Area of Little Pond

NEW JERSEY (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Struble 21-34-3-5-2	RS	Paulins Kill	Sussex	N. of Little Pond; foot of Cliff
Hendershot 21-34-3-2-6		Swartswood L.		700 yds. N.of Little Pond
Gum 21-34-3-6-3		Little Pond		800 yds E. of Little Pond
Swartswood Lake (18)	C	Paulins Kill, Swartswood L.	"	Vicinity of Swartswood Lake
Unnamed (2)	V	Paulins Kill, Swartswood L.	"	Vicinity of Swartswood Lake
Emmans Grove (2)	RS	Paulins Kill, Swartswood L.	"	Ca. 150 yds. from Swartswood lake
Unnamed (3)	C	Paulins Kill, Swartswood L.	"	Near outlet to lake
Middleville (2)	C	Paulins Kill	"	E. bank of Paulins Kill; less 1-mile below Middleville
Middleville, (3)	C	Paulins Kill Trout Brook	"	Middleville Area
Catfish Pond, (3)	C	Paulins Kill Catfish Pond	"	Vicinity of Stillwater
Stillwater, (3)	C	Paulins Kill	"	Downstream from Stillwater
Stillwater, (4)	C	Paulins Kill	"	Vicinity of Stillwater
Preston Meadows	RS	Paulins Kill	"	0.5 miles SE of Stillwater; edge of swamp;near S. end
Stillwater Station (5)	C	Paulins Kill	"	Vicinity of Stillwater Station E. of Stillwater
Fredon (4)	C	Paulins Kill Unnamed Trib.	"	Vicinity of Fredon
Swartswood Station (3)	C	Paulins Kill	"	North of Station

NEW JERSEY (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Swartswood Station 21-34-3-9-5	BG	Paulins Kill	Sussex	SW of Station;intersection of Middleville and Swartswood Rds.; SE of Spring Lake
Hendershot Farm 21-35-1-3-8,9	C	Paulins Kill	"	One mile SW of Balesville; sharp bend of Paulins; west bank
Wm Reinhardt 22-1-4-9-3	*C-1	Delaware River	"	S.of Port Jervis;2.5 miles S. of State Line;on Mashipacong Island
Jakely 21-33-6-8-2,4,5	*C-2	Delaware River	"	S. of Wallpack Center;ca. 2.5 miles W. of road;road from Wallpakc Center forks; going S. to Flatbrookville; N. to Bevans;site directly in front and a little to right as approach fork
Rosendrans Ferry 21-23-7-8-8 21-33-1-2-1	*C-3	Delaware River	"	One mile N.of Bushkill,Pa.; in N.J.;site begins at Ferry and goes S.; ca. 1200' long
Abers 21-23-7-9-5	*C-4	Delaware River	"	Cross Del. Riv. at Rosenkrans Ferry; go 0.4 miles E.; turn left 0.5 miles;site on left 1500' from Delaware
Valley Dude Ranch 21-23-8-3-2,3,4,5 Lazy K Bar Rand 21-23-9-1-1	*C-5	Delaware River	"	S.of Wallpack Center;ca.2.5 miles;W.of Road this site 0.8 S. of Jakely
Calini 21-24-1-6-1	*C-7	Delaware River	"	S.of Bevans;small brook flowing west into Del.Riv. 1.7 miles SE from Bevans on right of road;250' to south
Ludwick Haney 21-24-1-7-8 21-24-4-1-1,2,4 21-23-6-3-6,9	*C-7	Delaware River	"	S.of Bevans;3.2 miles SE of Bevans; 1.5 miles downstream from Calini site; approx. 1 mile long

NEW JERSEY (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Bevans Rock Shelter 21-24-2-1-5	RS	Delaware River	Sussex	0.8 miles SW of Bevans; road from left;0.1 miles up this road;RS on left; ca. 250'from road;at crest of hill
Lovick 21-32-6-2-6,9	*C-8	Delaware River	Warren	N.of Columbia,N.J.;Trenton Boy Scout Camp ca.12 miles N.of Columbia; 1.8 miles beyond camp to farm lane on left;0.4 miles left on lane; site on both sides of lane after crossing Cr.;Van Campen's Brook;1400' long
Dickinson Farm 21-32-6-3-1,2	*C-9	Delaware River	"	Opposite N.central portion of Depew Island
Wilmott 21-32-6-5-4	*C-10	Delaware River	"	N.of Columbia,N.J.;1.1 miles beyond Boy Scout Camp;0.7 S.of Lovick;opposite N.point of Poxona Island
Peters 21-33-1-1-9 21-33-1-2-7	*C-11	Delaware River	Sussex	Opposite Bushkill,Pa.from Rosenkrans Ferry on Flatbrookville R.;0.6 miles; lane R;1.1 mile on Lane
Quinn 21-33-1-2-6	*C-12	Delaware River	"	Adjacent to Peters site; 0.2 miles down lane after 0.6 miles from Rosenkrans Ferry on Flatbrookville Rd. 0.9 miles from Peters
Hardwick 21-33-5-2-2,3	RS	Paulins Kill Jacksonburg Cr. Sands Pond	Warren	N.Shore of Sands Pond;ca. 125'above Pond level;NW of Hardwick
Camp No-Be-Bo-Sco 21-33-5-2-3,6	C	Paulins Kill	"	E. and NE shore of Sands Pond;see Hardwick,N.J. Site RS-2
Kline 21-44-3-8-9	RS (Not on Map)	Pequest River Unnamed Trib.	"	Andover;4 miles to X rds. at Tranquility;right 1.7 miles to X rd.;right 300"; RS on right 30'from SE from Greenville

NEW JERSEY (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Stuyvesant Estate	C (not on Map)	Pequest River Trout Brook	Warren	Near Tranquility;0.3 miles on Old Hackettstown Rd.from Tranquility in S.direction; site 500' from road
Gun Club 24-3-3-8-1	RS	Pequest River Unnamed Brook	"	N.of Great Meadows,E.of Hope; near Club House of Pequest Valley Rod and Gun Club;ca. 4 miles from Great Meadows; brook 300' from Shelter
Gun Club #2	C	Pequest River	"	N.of Great Meadows;at turn on left from road into lane leading to Club House;ca.05 miles downstream from Gun Club site
Faery Hole 24-4-1-1-8	RS	Pequest River	"	N.of Great Meadows;ca.1.75 miles from Gun Club;ca.0.5 miles from River;ca.500' straight line from dirt rd.
Kulych #2 24-4-1-4-5	RS	Pequest River	"	3.5 miles up dirt road that previous 3 sites were on; RS on right;#1 100' from Rd.;#2 300'N.of #1;500'W. is small brook;key dirt Road;1.6 miles NW of Great Meadows;enters the Hope G.M. road from the right
Kulych 24-4-1-4-5	RS	Pequest River	"	3.3 miles up dirt road; other 4 sites on this rd.; at 3.3 miles is brook site 100'beyond brook on right; 100'from road
Gun Club #3 24-4-1-7-1	RS	Pequest River	"	2.8 miles up dirt lane;path from right;1000'bear left here 500';Pequest Riv.ca. 0.5 miles away;marsh lands of Pequest within 100'
Hoyt 24-12-3-2-2-3 24-12-3-3-1	C	Pequest River	"	Near Butteville;Rt.#6 W.of Butteville;0.4 miles;on S. side of Road

NEW JERSEY (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Groff 24-23-1-6-8,9-9-2,3	C	Musconetcong River	Warren	W.of Hampton;on #30;on left just after crossing river
Kerr-Reigle Paper Co.	C	Delaware River	Hunterdon	N.of Frenchtown;1.3 miles toward Mill Ford;lane from left;to RR tracks;Kerr's private road 75'from the crossing
Kimbel 27-43-6-6-1,2	C	Rancoccis Creek	Burlington	E.of Bridgeboro;from juncture of Burlington,Mt. Holly Rd.with N.J.25 (in 1938);4 miles on #25;turn left on Beverly;Rancoccis Rd.for 1.3 miles;lane off to right;site ca.0.5 miles down lane;N.shore of creek
Unnamed 27-34-9-1-1	C	Delaware	"	Near Stevens;take NJ 25(1938) S.of Bordertown to Stevens; right;0.7 miles to Del.Riv. opposite N.end of Burlington Island
Murray 27-34-9-7-8,9	C	Delaware River Assicunk Creek (Assunpink Cr.)?	"	Near Burlington;left of NJ 25 (1938) on Federal St.;to Shriner's home;1/8 mile to past home;east;left on York Rd.;1-mile to Murray House; S.bank Creek;3 miles from Del. Riv.
Sherman 27-34-9-8-5,6,8,9	C	Delaware River, Assicunk Creek, (Assunpink Cr.)?	"	Near Burlington;0.5 mile upstream from Murray Site; S.side of creek;just E.of Mill Creek;this is a small tributary af Assicunk Cr.
Martin 27-34-9-8-1	C	Delaware River Assicunk Creek (Assunpink Cr.)?	"	Near Burlington;left,off NJ 25 (1938) onto Columbus Rd.;1.1 mile;right into Neck Rd.;house 0.3 mile from above turn;N.side of Cr. 500 yds from Creek

NEW JERSEY (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Wilkins 27-34-9-8-9 27-34-9-9-7 27-44-3-3-1	C	Delaware River Assicunk Creek (Assunpink Cr.)?	Burlington	Less than 0.5 mile from Sherman Site; to SE;N.side branch Mill; S.side Assicunk Creek
Sutton 27-35-7-7-4	C	Delaware River Assicunk Creek (Assunpink Cr.)?	"	E.of Assicunk Cr.;ca.0.75 mile from Wilkins Site;Cr. 200'from Site
Seiler 27-35-7-7-7	C	Delaware River Assicunk Creek (Assunpink Cr.)?	"	E.of Assicunk Cr.;ca.0.25 mile SW of Sutton Site; 300' from Creek
Severns 27-43-5-3-2	C	Rancocas Creek	"	At Riverside;E.side of town;ca.2 miles W.of Kimbel site;300'from Creek'Marsh intervenes
Newman 27-43-6-5-9	C	Rancocas Creek	"	Ca.0.5 miles SSE of Kimbel Site;S.shore Rancocas Cr.; on W.side of Small trib.of Rancocas;50' from site;400' from Rancocas
Newman #2 27-43-6-9-2	C	Rancocas Creek	"	Ca.1500'S.of Rancocas Cr.; this site separated from Merril Kendall Site (see below)by Bridgeboro Centerton Road
Merril Kendall 27-43-6-9-2,4,5	C	Rancocas Creek Unnamed small Tributary	"	Ca.0.75 miles S.Kimbel Site; S.side Rancocase; Rancocas Ca. 0.05 miles to north
Wills 27-44-1-8-9 1-9-7 4-2-3	C	Rancocas Creek Mill Creek	"	Little less 2 miles NE of Kimbel Site;S.side Mill Creek
Brickyard 27-44-4-4-8,9 4-5-7 4-7-2,3 4-8-1		Rancocas Creek	"	N.side of creek;ca.1 mile upstream from Kimbel Site ca.100 yds from creek
Smith 27-44-4-8-5,6	C	Rancocas Creek	"	Ca. 1.75 miles upstream from Kimbel Site;N.side of creek; ca.280 yds. from creek

NEW JERSEY (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Powell 27-44-4-9-8,9	C	Rancocas Creek	Burlington	S.of Rancocas;just N.of Friends Burial ground;ca. 2.25 miles upstream from Kimbel Site;Rancocas Cr. 400'away
Jessup 27-44-5-8-7 31-4-2-1-3 2-2-1	C	N. Branch Rancocas Creek	"	E. of Centerton; a little up from Fork of Rancocas; N. side of creek small ravine W.side delimit site this ravine at fork of cr.
Stevenson 27-45-1-4-3,6	C	Unnamed Stream	"	E. and some S. of Burlington; W. of Jacksonville
Nickolson 27-45-4-4-4	C	Unnamed Stream Barkers Brook	"	N.of Mt. Holly;left off Federal St. in Mt. Holly onto Main St. 1.5 mile toward Burlington; lane enters from right;on lane 0.6 mile
Prentice 28-11-5-8-6,9 5-9-4,7 8-3-1	C	Assunpink Creek Shipetaukin Cr.	Mercer	Near Lawrenceville;NE of and in bend of Shipetaukin Cr.; NE of Lawrenceville
Cranstown 28-11-5-8-7,8 28-11-8-2-1 28-11-8-2-3	C	Assunpink Creek Shipetaukin Cr.	"	Across creek from Prentice site;distance of few 100 yds.
Narraticon 30-23-2-3-9		Delaware River	Gloucester	S.side High Hill Rd.;Logan Township;near mouth of Cr. W.of Bridgeport;S.side of Cr.
Whiteside 31-4-9-8		Rancocas Creek Haynes Creek	"	E.side Medford;Mt. Holly Rd.'ca.1.5 miles from Medford Traffic circle; Haynes Cr.1 mile away
Riggins Farm 34-13-3-6-1		Pine Mountain Branch Cohansey River	Cumberland	3-miles from Cohansey R. on P.M.Brook; 3 knolls;1 W. and 2 E.of Brook;between Roadstown & Greenwich;W.of Bridgeton

NEW JERSEY (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
(31-2-3-4-3)	C	Delaware River Pensauken Cr.	Burlington	Ca.1-mile SE Tacony-Palmyra Bridge;S. N.J. #S41 S. of Pensauken
Mashipacong Island 22-1-4-7-5,6,89 4-8-1,2-3-4-5-6-7-8 4-9-1,2,3,4,5 5-7-1,2,3	*C-70	Delaware River	Sussex	In Delaware Riv.;ca. 2 miles below Port Jervis
Allison 28-21-9-3-5,6		Delaware River	Mercer	W.side of Yardville,Hamilton Sq. R.;0.8 miles from Yardville SE of Trenton;Hamilton Two;NW side of Bock Creek;just upstream from head of Gropps Lane
Ware		Salem Creek	Salem	(Within 100' of Bank; flooded only especially high water)
Unnamed	C	Delaware River	"	Across Del.R. from Stroudsburg directly between Buttonwood Lake and Riv. at foot of mountain on the flats; location in doubt
Unnamed	V	Delaware River Paulins Kill	Warren	Columbia
Brotmansville	E			Six miles from Vineland
Wood's Mill 30-34-9-4-4			Salem	Area known as Slabtown;NE cor.of Salem Co.;400' W. of small Lake on Salem Cr.
Florence 27-34-6-7-5	C	Delaware River	Burlington	Midway between Florence and Burlington Island;above Assiscunk Cr.;350'E. of Florence-Burlington Rd.; tidal Marsh 300' from rd. to Delaware River.

NEW JERSEY (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Davenport Farm	*V-9	Delaware River	Sussex	Directly across from Milford,Pa.;on river flats; from flats inland 0.25 Mi.
Biccum Farm	*E-12	Delaware River	"	Midway between Milford & Dingman's Ferry;on Flats
Unnamed	*E-13	Delaware River Unnamed Tributary	"	Above mouth of creek;Delaware tributary;enters opposite Dingmans Creek
Burke Farm	*C-74	Delaware River	"	Across River from Brum baugh sites (Pa.) vicinity of Dingmans Ferry
Boy Scout Camp Site	C	Delaware River	"	This area is questionable

ARCHAEOLOGICAL SITES - NEW YORK

Deposit	C	West Branch Delaware River, Oquaga Creek	Broome	Along Creek; 1 mile W.of Deposit N.side of creek
Kelley Corners	E	East Branch Delaware River	Delaware	N.of Margaret;down from Kelley Corners; latter ca. 3.25 mile from Margaretville;W.side of River; on River
Arkville	E	East Branch Delaware River Bush Kill	"	W.of Margaretville;W.of Arkville;apparently close to Juncture of Bush Kill and Dry Brook;N.side of Bush Kill
Dunraven	C	East Branch Delaware River Platte Kill	"	At Dunraven;possibly N.and E.of it;back from and E.of Creek
Arena	E	East Branch Delaware River	"	Between Arena & Margaretville;ca.3 miles E.of Arena; N.side of River
Arena		East Branch Delaware River Mill Creek	"	Near juncture of Mill Cr. with Delaware R.;E.of Mill Creek

NEW YORK (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Arena		East Branch Delaware River Coles Cove	Delaware	Near juncture of Mill Cr. with Del.R.; W.of Mill Cr. on Delaware River
Pepacton		East Branch Delaware River Coles Cove	"	At juncture of Del.Riv.& Coles Cove;ca.1.25 miles W.of Pepacton;N.side of Delaware River
Deposit	V	West Branch Delaware River	"	E.side of River;at or near Deposit
Deposit	E	West Branch Delaware River	"	E.side of River at or near Deposit
Hale Eddy	C	West Branch Delaware River	"	Ca.1-mile E.of Hale Eddy; on River;north side
Hancock	V	Delaware River	"	At Hancock;juncture of E. and W.branches;I.W.Seymour property,lots 1 and 2
Hancock	BG	Delaware River	"	At Hancock;E.side of River; Casper Egbert property; juncture of E.and W. Branches;on Great Lot 35, Div.9 of Lot 2
Big Island	V	Delaware River	Sullivan	On Big Island; 2 miles above Cochecton
Cochecton	V	Delaware River	"	In Cochecton; Alfred Hulse property
Barryville	E	Delaware River	"	W. bank of Brook;from juncture of Delaware River.approx. 1 mile
Indian Field Pond	V	Monquap River CR	"	SW portion of Bethel Twp.; village site apparently on W.end of lake camp site (?) on east
Monquap	V	Monquap	"	In or near Monquap;at juncture with Delaware R.; Village W. of Monganup River

NEW YORK (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Port Jervis	V	Neversink River	Orange	Near Port Jervis; along Neversink; Van Etlen Est. apparently N.side of Riv.
Port Jervis	*C-4	Delaware River	"	Along river;E.side;from Old Bottom Basin to Tristate

ARCHAEOLOGICAL SITES - PENNSYLVANIA

Matamoras	*E-1	Delaware River	Pike	Two miles strip of river bank S. of Matamoras
Matamoras	*E-2	Delaware River	"	3 Miles S. of Matamoras; small stream enters Delaware
Quicktown School	*C-1	Delaware River Cummins Creek	"	At mount of Cummins Creek; both S. of bank creek
Cummins Cr. Rock Shelter	RS	Delaware River Cummins Creek	"	One mile from confluence with Del. Riv.; E. bank of Creek; 20' above creek
Milford	*E-3	Delaware River	"	On River flats N. of Milford
Milford	*C-2	Delaware River Saw Kill	"	On river; S. bank of Saw Kill confluence with Riv.
Milford	*C-3	Delaware River	"	Two mile below Milford; opposite N. end of Minisink Island
Indian Point	*C-4	Delaware River Raymond Kill	"	In fields; N. and S. of mouth of Kill; opposite lower end of Minisink Is.
Log Tavern Pond	C	Delaware River Raymond Kill;1st Log Tavern Pond	"	On SE shore of pond where Raymond Kill exists
Dry Brook	*E-4	Delaware River Dry Brook	"	River flats below Namanock Island near mouth of Dry

PENNSYLVANIA (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Adams Creek	*E-5	Delaware River Adams Creek Long Meadow Br.	Pike	On River banks below mouth of Adams Creek
Adams Creek	C-6	Delaware River Adeams Creek, Long Meadow Br.	"	S.bank Adams Creek; at juncture with Long Meadow Brook 3 miles from Delaware River
Dingman's Ferry	*E-6	Delaware River	"	Particularly below mouth of Dingmans Creek; on River Bank; distance of one mile
Brumbaugh Farm #1	*C-7	Delaware River	"	Ca. 5 miles north of Egypt Mills
Hill Farm	*E-7	Delaware River	"	4.5 Miles north of Egypt Mills
Brumbaugh Farm #2	*E-8	Delaware River	"	Apparently connects with Hill Farm site; 4.5 miles N. of Egypt Mills
Browning & Pharo Prop.	*E-9	Delaware River	"	Not more than 4.5 miles N. of Egypt Mills
Brodhead Farm	*E-10	Delaware River	"	Little more than 1-mile N. of Egypt Mills
Eshback Farm	*C-8	Delaware River	"	Ca. 1 mile north of Egypt Mills
Meyer Farm	*C-9	Delaware River Tom Creek	"	On Delaware R.;from mouth of Tom Creek north;i.e. from Egypt Mills, North
Unnamed	*E-11	Delaware River Tom Creek	"	On flats of Delaware River just below mouth of Tom Cr.
Egypt Mill Farm	*E-12	Delaware River	"	0.5 mile below Egypt Mills; on River Flats
Zimmer Farm	*E-13	Delaware River	"	Just above Bushkill
Minguannam (Minguhanon)		Christina River Red Clay Creek White Clay Cr.	Chester	In London Britain Twp.;near Strykersville;on Old London Tract Meeting House;near Yeatman's Mill

PENNSYLVANIA (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Wills Site		Neshaminy Creek Little Neshaminy Creek	Bucks	Ca. 0.5 mile W. of Harsville Little less than 1-mile from Neshaminy Creek
Cochecton		Delaware River	Wayne	Above Chochecton
Narrowburg N.Y.		Delaware River	"	Narrowsburg;garden of Bert Lawrence site on farm
Honesdale			"	Top of cliff near Honesdale
Narrowburg N.Y.			Pike	Farm of Fred Brinkman
Milanville		Delaware River	Wayne	Farm of J. Young,R.D.#1
Milanville		Delaware River		Old Jesse Thomas place; Narrowsburg
Waymart			Wayne	Curtis Valley Farm;Clinton Twp.;Waymart;a meadow
Hoodleys			"	Farm of Frank P. Woodward
Angels			"	Vicinity of Town of Angels; particularly F.G. Martin Farm;latter along the Wallenpaupack
Maplewood			"	Hunting Hill;Maplewood; near Honesdale
Maplewood			"	Farms of Eugene and Frank Block; Maplewood
Branch Lake			"	W. W. Oliver Farm; Branch Lake; Pa.
Callicoon		Delaware River	"	In Pa.; opposite Callicoon, N.Y.; on bank of Delaware R.
Boyds Mills			"	Between Milanville and Boyds Mills, Pa.
Hoodleys			"	On the flats along Middle Creek; Hoodleys, Pa.

PENNSYLVANIA (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Hamlin			Wayne	Near Hamlin
Milanville		Delaware River	"	Farm of James Dolsen, Milanville
Damascus Twp.		Delaware River	"	Farm of James K. Orr, Damascus Twp.
Angels			"	F. H. Curtis Farm;Clinton Twp.,between Angels and Forest City
Angels			"	Farm adjacent to F.H.Curtis farm; near Forest City; between Forest
Lake Como			"	Near shore of Lake Como; in field near Spruce Lake Creek; juncture with Lake Como; on Stockport Rd.
Narrowsburg		Delaware	"	Lawrence Farm; 2-1/2 miles north of Narrowsburg;on the Delaware; Pa.
Newfoundland			"	Charles Schelbert Farm, Dreber (?); Oreber;Dreher; (?) Twp.
Cortez			"	Albert Spanginberg Farm; SW of Moosic (a Mt.?); in Cortez
Canaan			"	Swackhamer Farm; few rods from Stream running from the farm
Wechquetank			Monroe	Near Bethlehem;Pleasant Valley; Salem Church; in Gilbert; village within sight of church; ca. 1755; N. side of creek; ca. 8 miles from Kunkletown;N. toward Gilbert;burial ground 20 rods up the Cr.
Tannersville			"	Near Porters Lake

PENNSYLVANIA (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Shawnee-on-the-Delaware			Monroe	Shawnee-on-the-Delaware
Stroudsburg			"	Edward F. Starmer Farm; RFD #1
Brodheadsville			"	James Walz Farm; E. of Broadheadsville; near Lake Mineola; also on adjoining farm
Effort			"	Chestnut Hill Twp.;Effort, Pa.; farm of Cyrus Gould
Brodheadsville			"	Chestnut Hill Twp.,Brodheadsville Freeman Shiffer farm
The Wier Lakes			"	Vicinity of Lakes
McShaney			"	Near McShaney
Gilberts			"	Gilberts
Weir Springs			"	Weir Springs
Kresgeville			"	Chestnut Hill Twp.,Levi Borger Farm
Chestnut Hill, Twp.			"	John Felkers Farm
Chestnut Hill, Twp.			"	Dr. Gernards Farm
Polk Twp.			"	W. side; Sterners Gap Cr.
Penn Foresr Twp.			Carbon	No other location
Pocono Lake			Monroe	Tobyhanna Two; Pocono Lake; in lack bed when water is low; area approx. 25 yds. square; on top of Pocono Mts. owned by Mt. Ice Co.
Effort			"	Adjacent P. W. Kresge Farm, Effort, Pa.

PENNSYLVANIA (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
North Water Gap			Monroe	Old Prime Property
Shawnee-on-Delaware			"	Near Brodheadsville, Chestnut Hill Township
Gilberts			"	Weir Lake
Christman Farm Fishery			Carbon	
Saylorsburg				Stamer Farm
Effort			Monroe	W.H. Dinstel Farm; foot of Pocono Mts.
East Stroudsburg			"	Lyman Moshier Farm
Shawnee-on-Delaware			"	Several farms at Frutcheys
Gilberts			"	Hawk Farm; near Gilbert
Ross Common			"	Ross Common, Pa.; top of Mt.
Hatchery			Carbon	Hatchery, Carbon County
Effort			Monroe	Barthold Farm; Effort, Pa.; now owned by Green; note particularly creek between Effort and Gilbert
Reeden			"	1.5 mile NW Reeden; John Rinker place adjacent
Gilbert			"	Near Gilbert; 12 or more graves; Polk Twp.
Gilbert			"	Fields S. of Gilbert; 100 yds. known as Indian City
Swiftwater			"	D. W. Bowman Farm
Pocono Station			"	Wm Wagner Farm; 1.5 mile from Pocono Station
Gilbert			"	In vicinity of Gilbert

PENNSYLVANIA (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Gilberts			Monroe	J. Edwin Gregory Farm
Brodheadsville			"	John Walz Farm
Tannersville			"	Henry Learn Farm; other farms in and near town
Shawnee-on-Delaware			"	Walter V. Herman Farm
Snyderville			"	J. A. Hlarps Farm
Portland			"	Portland
Jonas, or Jones			"	Jonas, near
Saylorsville			"	Along Blue Mts., near Saylorsburg
Snyderville			"	Vicinity of Snydersville, mostly along McMichael Cr.
Kellersville			"	Vicinity of
Tunkhannock Twp.			"	Mahlon Mayer Farm; possible near Long Pond
Shawnee-on-Delaware			"	Along banks of Delaware R.
Shawnee-on-Delaware			"	On hill above town
Pocono Lake			"	Pocono Lake Dam; dredging to build the dam
Henryville			"	Arthur Post Farm
Anthony Farm			"	Between Stroudsburg and Analomink N.of Stroudsburg; between the DL & W RR and Brodhead Creek
Mt. Pocono			"	Lewis Halstead Farm; Mt. Pocono; south side of "Big Pocono"

PENNSYLVANIA (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Polk			Monroe	Polk
Pa. Forest			Carbon	Pa. Forest
Kresgeville				Junction of Wild and Pohopoco Creek
Dingman Twp.			Pike	Brodhead Farm; Dingman Twp.; Pike Co.
Pocono Lake				Site now covered by lake
Porters Lake			Monroe	
Stroudsburg			"	E. F. Starner Farm
Hamilton Twp.			"	E. A. Saylor (Farm)?
Shawnee-on-Delaware				Five miles N. of Shawnee-near Dimmick Ferry; John Michael Farm
Egypt Mills			Pike	N. of Bushkill
Bushkill			"	Bushkill Poultry Farm
Porters Lake			"	Back of Club House facing
Porters Lake			"	On side of outlet of lake to right of lake outlet in field
Paupack			"	Dan and/or Ben Killam Farm; apparently 2 farms; 2nd should not be inundated by lake waters
Paupack			"	Between Henry Clark House and River
Paupack			"	Purdytown

PENNSYLVANIA (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Paupack			Pike	Old Henry Clark Farm; road thru Tofton; straight on past the E.Lynn and Weill Farm; down along hill to Sheridan (Bingham) farm.
Glen Eyre			"	Buckskin Cove; near Glen Eyre; along old Turnpike; 6 miles from Glen Eyre
Glen Eyre			"	White Deer Pond; 7 miles from Rowland
Rowland			"	White Hall Farm; 4 miles from Rowland
Lackawaxen			"	Henry Trotsky Farm; along and in Delaware and Hudson Canal
Greentown			"	Mrs. Alice Sheffler Farm
Greentown			"	Adam Miller Farm; formerly Corey
Egypt Mills			"	Ripi Nilis Farm; fronts on Delaware River
Twin Falls			"	Outlet of Big Twin Lake
Welcome Lake			"	Near Welcome Lake; Many A. Cose Farm
Lords Valley			"	Lords Valley
Lords Valley			"	One mile of Lords Valley
Blooming Grove			"	Near by
Cochronville			Chester	Jacob Blair Farm; and an unnamed farm
Phoenixville			"	Christman Farm; N. of Phoenixville
Phoenixville			"	Black Rock; 0.5 mile N.of Phoenixville

PENNSYLVANIA (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Phoenixville			Chester	S.side river better than N.side in Montgomery Co.
Lenape			"	Along Brandywine
Pocopson			"	Along Brandywine
Northbrook			"	Indian Deep
West Marlborough			"	M.V. Baldwin Farm
W. Brandywine Twp.			"	Chas. Hatfield Farm; E.of Brandywine Creek
Brandamore			"	C.T. Mitchel Farm;0.25 mile S. of Brandamore; W. of Brandwine
Nottingham			"	W. Nottingham Twp.; J.E. Brown Farm; Indian Spring on this farm
Lenape			"	Bluff facing S. close to tributary of Brandywine; near Lenape
Lenape			"	Carter Farm; on Brandywine; 0.5 mile from Lenape
E. Brandywine Twp.			"	Reeds Road Station
Doe Run			"	Doe Run, Unionville, Willowdale
Pocopsin Twp.			"	In
Embreeville			"	At
Strikersville			"	Undetermined
Phoenixville			"	St. Peters (Pikeland) cemetery; six miles west
Popcopson			"	Mathers Farm; 1-mile S. of Lenape on Brandywine
Willistown Barren			Delaware	Undetermined

PENNSYLVANIA (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Pocopson			Chester	Undetermined
Lenape			"	Two miles N.of;on Brandywine;Sud's Rock; on Mowen Worth Farm
Northbrook			"	Indian Deep
Northbrook			"	Norman Ganthrop Farm
West Chester			"	Dr. Ashton Farm; Delaware, Chester Farm
Oxford			"	Noble Ray Farm
Newlin Twp.			"	Undetermined
W. Tallonfield Twp.			"	S. W. Hodgson Farm; near Cochranville (?)
Northbrook			"	One mile above; also mounds
Newlin Twp.				Property of J. W. Funk and W. J. Jones; near Embreeville?
E. Goshen Twp.				Jackson Farm; SE of present barn
London Britain Twp.				Indiantown
Newlin Twp.				Near Indian Deep; Abram Marshall and S.M.Cochran Farms
F. Bradford Twp.				Along Brandywine
Charlestown Twp.				R. M. Rennard Farm; Devault,Pa.
St. Peters				John Kratz and Mertz Farm; near St. Peters
E. Goshen Twp.				H.H. Pratt and J. S. Pratt farms near source of Ridley Creek; ca. 2 miles from Okehocking
Parkerford				Reinhart Farm; 10 miles N.of Valley Forge & 1.5 miles W. of Parkerford

PENNSYLVANIA (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Kennett Square				Willowdale Nurseries Company grounds
Lenape				West Branch of Brandywine; 7 miles above Lenape; along bank
Pocopson				Lambert Farm; W. branch of Brandywine between Pocopson and Wawaset
W. Marlboro Twp.				Madden Farm
W. Marlboro Twp.				Carter Farm and Taylor Farm; near Upland
E. Goshen Twp.				Bush Farm
W. Goshen Twp.				Oakland Pond School Grounds
Northbrook				South side Pa. RR tracks 0.75 mile west of Northbrook
Royersford				In Schuylkill River below bend at Linfield; one mile above Royersford
London Grove				E. B. Walton place; formerly L. F. Friends School grounds
West Chester				S. of West Chester; Paoli Rd.; ca. 5 miles E. of West Chester
Black Horse				Comulus (?) property; near Black Horse
Newlin Twp.				Near Northbrook on W. branch of Brandywine; farm of Mr. Penozen; ca. 6 miles west of West Chester
Spring Mill			Montgomery	One mile south of Conshohocken
Sumneytown			"	Two miles N. of Earl Henuber Farm

PENNSYLVANIA (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Sumneytown			Montgomery	Craven Farm;2.5 mile N.of on Ridge Valley Creek
Sumneytown			"	Unnamed spot; E.Swamp Cr.
Oaks			"	Field near Green Lane Borough School
Hatboro and Maple Glen			"	Mann Farm; headquarters Pennapeka Creek
Guest				In Brandywine Cr.; 1/2 mile below Chadd's Ford
Westlager				In Doc Run;tributary of Brandywine;near Embreeville
			Lehigh	Vera Cruz; just north; semi-wooded hillside
Rattlesnake Hill			Bucks	One mile from Delaware River
Weider Farm				Saucon Creek;2-mile W.of Limeport
Mast Farm				1.5 mile S. of Limeport
Stoudt Farm				Vera Cruz
Miller Farm				Macungie
				At Feuersteinburg;near Bowers Station
			Bucks	Near Coopersburg
			Berks	Leinback's Mill
				Long Swamp
Gilbert Montgomery Farm			Chester	Glenmoore;Wallace Twp.; Old Henderson property; E.branch Brandywine; blighted Chestnut Tree
Chadd's Ford				On Brandywine

PENNSYLVANIA (Continued)

SITE	KEY. BASIN	COUNTY	LOCATION
Brinton's Bridge			On Brandywine
Pocopson			On Brandywine
Lenape Park			On Brandywine
Wawaset			In forks of Brandywine
Northbrook			West Branch Brandywine
Embreeville			" " "
Coatsville			" " "
Brandamore			" " "
Honeybrook			W.branch of Brandywine; present city
Katamoonchinck			Near Valley Creek;Whiteland Twp; Old Thomas Property; Valley Creek;Tributary of E.Branch Brandywine
Newlin's Tract			Right bank Brandywine;directly above roack with historical marker in present Newlin Twp. rock near Northbrook
Okehocking Reservation			Willistown Twp.; from Settlement near Ridley and Crum Cr.
Horney Farm			Above West Chester
Fountain Farm			Between Embreeville and Northbrook
Krauser's Bridge		Chester	On Marsh Creek
		"	Juncture of Marsh Cr.and Little Conestoga Road
Marsh Creek		"	Head of Marsh Creek

PENNSYLVANIA (Continued)

SITE	KEY	BASIN	COUNTY	LOCATION
Broomall		small stream;into Langford Run; Darby Creek; Delaware R.	Delaware	One on stream; the other on Langford Run-NE side of Run;modern quarry on SW side; separated from by Kemble's

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